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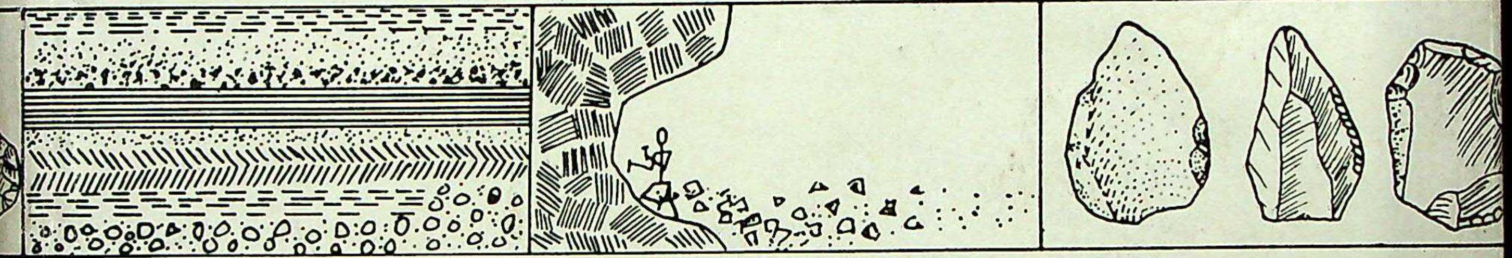

VIDULA JAYASWAL

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PALAEOHISTORY OF INDIA

Palaeohistory of India

(A Study of the Prepared Core Technique)

VIDULA JAYASWAL
Archaeological Survey of India
Janpath, New Delhi

AGAM KALA PRAKASHAN
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DEDICATED TO

my Grand Father

LATE DR. K.P. JAYASWAL,

The renowned Indologist,

whose works inspired me

to take up the studies in archaeology.

Preface

As a result of the extensive surveys undertaken by various investigators during the last century, the Stone Age Prehistory of the Indo-Pakistan sub-continent is now better known than what it was two decades ago. Time is now ripe to start specialised studies in the field of prehistoric typology and technology. This book is an attempt in this direction.

The typological studies in the Palaeolithic Period of India have so far been limited mostly to a broad classification of finished tool types. Various aspects of Palaeolithic technology too have been dealt with only in very general terms, with the result that basic questions regarding the various flake detaching techniques in different Stone Age industries are still shrouded in mystery. One of the important querries in this connection is whether there are differences among the various Palaeolithic cultures in respect of the techniques employed. It seems worthwhile examining the nature of Palaeolithic Cultures of India with the aid of scientific techno-typological analysis. Similarly, the considerations of technology may also prove helpful in determining the regional variations, if any, within a particular culture and separating one culture from the other. These obvious problems of Indian Palaeohistory, and the importance of techno-typological studies prompted the author, in 1968, to take up this study for Ph. D. of the Banaras Hindu University.

Some of the scholars and experts who were consulted before starting this study were highly sceptic. Shri B.K, Thapar Prof. A. K. Narain, and Prof. F. Bordes were, however, strogly in favour. But for their encouragement and optimisim, the study would probably not have been undertaken.

The author visited various centres of prehistoric research and made a first hand study of all the important Palaeolithic industries of the country. Palaeolithic collections made by scholars from time to time and preserved in various museums and institutes in India were carefully studied during these visits. Each artefact was examined in detail. The collections were re-classified according to methodology discussed in the book. Regarding the stratigraphical position of these industries, the word of the investigator was accepted as such. Similarly, the period assigned by the field workers to a particular industry was also retained in most of the cases. Some important Palaeolithic collections had, regretfully, to be left out since, in spite of all efforts, these were not available. The results of these studies were embodied in the author's Ph.D. dissertation entitled, 'A Study of Prepared Core Technique in Palaeolithic Cultures of India'. This book is a revised version of the dissertation supplemented by the Post-Doctorate original studies made by the author in Chotanagpur Plateau in Bihar on the same subject.

The book has been divided into seven chapters. After giving a very brief account of the History of Palaeolithic researches in the Indo-Pakistan sub-continent the Methodology and Terminology adopted in the present work have been discussed in detail in Chapter I. The hitherto reported Palaeolithic finds, with a brief note on the important geological features of the individual Palaeolith-yielding areas are referred to in Chapter II. The stratigraphical position and general typological features of the various Palaeolithic collections have also been included. The next three chapters deal with analysis of the technological features in detail and typological features in general terms in the Lower, Middle and Upper Palaeolithic Phases. Chapter VI is devoted to a general comparative study of the various aspects of flake detaching techniques in the Palaeolithic cultures of India. An attempt has also been made to analyse the factors influencing flake detaching techniques vis-a-vis factors which determine the size and shape of the flakes. The last chapter summarises briefly the conclusions drawn from the study.

The methodology used in this study is, by and large, as suggested by Prof. F. Bordes, Dr. Bohmers and Dr. G. Bosinski. The symbols used are those adopted by Dr. Bosinski. All illustrations including drawings of artefacts, maps and graphs have been prepared by the author herself. The study spread over five years, was carried out from the Department of Ancient Indian History, Culture and Archaeology, of the Banaras Hindu University. The author was awarded Research Fellowship of the Banaras Hindu University and the University Grants Commission for the duration of the study and is very grateful to both organizations.

My foremost thanks are to the staff of the Department of Ancient Indian History, Culture and Archaeology, of the Banaras Hindu University, particularly Dr. K.K. Sinha, Head of the Department, Shri P.C. Pant, my guide and supervisor in Ph.D. and Dr. J.N. Tiwari for guidance, encouragement and abundant assistance at all stages of the study and preparation of the manuscript.

Grateful thanks are also due to the following for permission and necessary facilities for the study of collections under their charge : Shri B.K. Thapar, Safdarjung Museum of the Archaeological Survey of India, New Delhi; Prof. H.D. Sankalia, Deccan College, Poona; Drs. R.V. Joshi and K.D. Banerjee, Prehistory

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Much help was received from the Librarians and the Library staff of the Department A.I.H.C. & Archaeology of the Banaras Hindu University; Archaeological Survey of India, New Delhi; Deccan College Post Graduate and Research Institute, Poona and is gratefully acknowledged.

Many friends particularly Dr. Chhaya Bhattacharya, Dr. Statira Guzder and Shri P.P. Sharma have helped me in correcting the manuscripts, proofs etc. To all of them I am deeply grateful.

Last but not the least, I am extremely grateful to the publishers, Messers Agam Kala Prakashan. It is entirely due to the keen personal attention and meticulous supervision at all stages of the printing, by Shri Agam Prasad, that it has been possible to bring out the book in the incredibly short period of one month.

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Vidula Jayaswal

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CHAPTER I

Introduction

This chapter is an introduction to the present work which intends to examine the technological aspects of the various palaeolithic industries of India. In the following pages it is proposed to give at first a very brief account of the history of palaeolithic researches in the Indo-Pakistan sub-continent. It will be followed by a short discussion on the methodology adopted in the work as well as the explanation of the terms used.

HISTORY

Only a few decades after the pioneering declaration of Bouches de Perthes in France, Bruce Foote made the discovery of a cleaver in a laterite pit at Pallavaram near Madras, in the year 1863 (Foote, 1866). Inspired by this remarkable discovery, he undertook painstaking exploration in different parts of the south, central and western India and published the results in two volumes (Foote, 1914 and 1916). While Foote was busy in the Peninsular India, scholars like Coggin Brown (1917), Cockburn (1888), Hackett (Ref. to Sankalia 1962), Ball (1876) and Manley Aiyappan, (1942) found evidence of Old Stone Age in Rajputana, Uttar Pradesh, Madhya Pradesh, Orissa, Andhra Pradesh and Tamil Nadu, respectively. As a result of the extensive surveys undertaken by these investigators, India was placed on the prehistoric map of the world as an important habitat of the palaeolithic man. But except Bruce Foote, none of them worked on a systematic plan and most of their discoveries were of a sporadic nature.

If Foote was responsible for the initiation of the study of Old Stone Age cultures in India, it was the Yale Cambridge Expedition of 1935 which started an era of systematic investigation in the field of prehistoric research (De Terra and Paterson, 1939). This expedition not only discovered a new palaeolithic culture 'Soan', in the north-western part of the Indo-Pakistan sub-continent (named after Soan, a tributary of the river Indus), but also presented for the first time a comprehensive and integrated study of the geology of the region (De Terra *et al.*, 1934 and 1939). The team also put forth a probable correlation between the geological deposits of north-western India and those of central India, along Narmada. The clues left by Bruce Foote and the later expedition were taken up by Sankalia, Krishnaswami, Bose and Sen, who carried out extensive and intensive surveys of Gujarat, Maharashtra, Madras, Orissa, Central India and Punjab. After independence, the Archaeological Survey of India and several Indian Universities, notably Poona and Allahabad, undertook prehistoric investigations in different parts of the country. In this context we may mention the following: Late B. Subbarao surveyed Bellary (1948); R.V. Joshi--Malaprabha (1955); K.D. Banerjee—Maharashtra (1957); A.P. Khatri—Malwa (1958); G.C. Mohapatra—Orissa (1962); V.N. Misra—Rajputana (1961); S. Issac—Kurnool district (1960); R. Singh—Bundelkhand (1965); S.G. Supekar—Central Narmada basin (1968); Nisar Ahmed—Upper Son valley (1966); R.S. Pappu—Krishna basin (1974); M.L.K. Murty—Chittoor district (1966); K.T. Reddy—Cuddapah district (1968); S.N. Rao—Nalgonda district (1966); K. Paddayya—Shorapur Doab (1968) etc. A few of these surveys were also accompanied by small-scale excavations. The system adopted by them consists of selecting small geo-morphological units and subjecting them to detailed investigations. The geological personality of each area has been studied along with the cultural activity of the Pleistocene man by them. The other institutions which are quite active in palaeolithic researches could be named as—the department of Ancient Indian History and Archaeology, University of Allahabad: and department of Anthropology, University of Calcutta. Under the able guidance of Prof. G.R. Sharma, the team from Allahabad has brought to light some very important evidence of palaeolithic phase from the rivers Belan and Seoti in the districts of Mirzapur and Allahabad (Sharma, 1973) and also from the Upper Son valley. Similarly, under the supervision of (Late) Prof. N.K. Bose and Shri D. Sen the team from Calcutta University has surveyed parts of Orissa (1949), West Bengal and Chotanagpur plateau (Ghosh, 1970). The activity of various departments of the Archaeological Survey of India in the field of palaeolithic researches could be mentioned, in brief, as follows:

Survey of Beas and Banganga valleys by B.B. Lal (1956), Kangra valley by R.V. Joshi (Ref. to Sankalia 1962: 20); excavations at Adamgarh rockshelter by Joshi (1964); excavations in Nagarjunakonda valley by H. Sarkar, Subrahmaniyam *et al.*, (1976); an intensive examination of Pleistocene sediments and activities of Stone Age man in the basin of Kortalyar by K.D. Banerjee (*IAR*, 1961-1968) and survey of Sisunia valley in the district of Purulia by Dasgupta (1971).

As a result of the aforesaid investigations, the artefacts of Old Stone Age have been discovered from nearly every part of the continent. What is more significant is that it is now possible to apply the three-fold cultural-division of the Palaeolithic period in this sub-continent, as well. For, the hitherto unknown phase of Upper Palaeolithic, has recently been recognised in definite stratigraphic contexts.

The industries characterized by handaxe, cleaver, chopper and chopping-tools along with comparatively big flakes come from the earliest gravel deposits of various rivers. They belong to the Lower Palaeolithic period and could be assigned to the Middle Pleistocene period (Zeuner, 1950). The basis for this data is the relative typological studies and also some faunal remains. Two cultures have so far been recognised in this phase of the Indo-Pakistan sub-continent. These are—the 'Soan culture' restricted to the north-western part of the sub-continent and 'Madrasian culture', primarily a culture of the Peninsular India (Krishnaswami, 1938). The former is characterized by chopper and chopping-tools along with flakes of Clactonian and 'Proto-Levallois' facies, while the latter is predominated by handaxe and cleaver. At times, the latter is also associated with a limited number of pebble-tools. The traces of Madras culture have also been found in the north-western, eastern and north-eastern India. The existence of two groups within the Lower Palaeolithic has thus been taken for granted by scholars. The question, however, needs fresh examination in the light of evergrowing evidence. On the basis of typo-technological analysis, there is a possibility of screening the Lower Palaeolithic industries within four or five groups (Jayaswal, 1973) instead of the well known two.

The Middle Palaeolithic phase has been assigned to Upper Pleistocene period (Zeuner, 1950). About half a dozen ^{14}C dates available for this phase range between 39,000 to 8,360 B.C. (Agrawal and Kusumgar, 1974). The characteristic tools of this phase consist of various types of scrapers and points usually made on flakes. Sankalia (1965) and Rao (1968-69) had earlier postulated a possibility of regional variations within the Middle Palaeolithic phase of India. However, no serious attempt to specify these variations has yet been made. In the present state of our knowledge, therefore, it is only natural to assume the existence of a single Middle Palaeolithic Culture in the Peninsular India, which has been termed as 'Nevasian', after the type site Nevasa (Sankalia, 1952). It was observed by us that a few assemblages from the Belan region, in Uttar Pradesh, Bhimbandh and Jamalpur (in south Bihar) showed some features which were not noticeable in the Nevasian (Jayaswal and Pant, 1973; and also Pant and Jayaswal, 1977). It is yet to be ascertained whether the industries located north of Vindhyas, in Bihar and Uttar Pradesh, assignable to this period, represent a culture different from Nevasian. Similarly, in the north-western part of the Indo-Pakistan sub-continent the industries assigned to the Middle Palaeolithic period are an advancement over the earlier Soan Culture and could form yet another cultural unit.

The existence of Upper Palaeolithic industries is found in the form of small pockets in Andhra Pradesh, Uttar Pradesh, Bihar and probably Maharashtra. At least in two regions, they are confined to a definite stratigraphic horizon. In the Belan valley they come from Gravel III, and in Singhbhum from the Upper clay. The only ^{14}C date available for this phase is 19,715±340 B.C. This date has been derived from the sampling of the shells from Gravel III of Belan (Agrawal and Kusumgar, 1974). Only in Chittoor district this lithic tradition, which is characterized by blade and burin implements, is associated with bone tools (Murty, 1974). It is to be investigated whether all the industries of Upper Palaeolithic phase here belong to one single culture.

For the present, studies on the cultural remains of the Stone-Age man in India are mostly limited to a very general classification of finished tools. The technological aspects have been dealt with only in vague terms and without the realization that a first-hand knowledge of the technological aspects is almost essential for understanding the prehistoric cultures in their totality. Besides, even the typological studies remain incomplete without a proper analysis of the techniques employed for manufacturing the artefacts. The studies so far carried out in the sphere of the palaeolithic phase of the Indian sub-continent, thus, lack precise delimination of typological as well as technological features.

The techniques prevalent in the various palaeolithic industries can be divided into two broad categories. In the first category, all those techniques can be included by which the palaeolithic man obtained flakes and blades. In the second, various methods of secondary working, retouching etc. can be grouped. In the literature on Indian prehistory, while the second category is comparatively well referred to, the observations on various blank-detaching techniques are generally ignored. As a result, doubts remain regarding the correlation of various blank-detaching techniques and the different industries. The other point which needs enquiry is whether there are differences between the Lower and the Middle Palaeolithic Cultures in respect of the techniques employed. We also need to know whether the subsequent cultures have evolved from earlier Lower Palaeolithic Cultures of different regions. Considerations of various techniques may prove helpful in determining regional differences within a culture and also for separating one culture from another. In fact, it was against the background of these unanswered queries of Indian prehistory that this dissertation was planned. Our intention here is to investigate as thoroughly as possible the exact nature and position of different blank-detaching techniques in the various palaeolithic industries, with an emphasis on the various classes of prepared core techniques. It may be mentioned in passing that the word 'prepared core' technique is not used in the present work in the sense of the Levallois technique only, but has a much broader application. This aspect has been discussed below in detail in the section dealing with terminology.

A study of blank-detaching techniques consists of two aspects. The first aspect can be stated as the study of techniques themselves, which is generally carried out by experimentation, as has been done by Bordes (1947), Barnes (1947), Leakey (1967), and Bordes and Crabtee (1969) etc. It was not possible for us to undertake this method. The second aspect is the study of techniques as a component of culture. Our investigation belongs primarily to the latter type. An attempt has been made by us to build up a comparative picture of the technological features of Palaeolithic India by calculating the exact proportion of the various blank and core types in the representative industries. Statistical analyses were found to be most suitable for the present study. During the course of our investigations, it was observed that statistical analysis may throw some light also on certain aspects of technology, which, if one so desires, can also be supplemented or varified by experimentation. Some such obvious observations have been briefly mentioned in the chapter on General Discussion.

METHODOLOGY

The type of work undertaken by us here requires somewhat different method of data collection than those that have been generally employed by the scholars of Indian prehistory. Special care was also needed to ensure that the statistical method followed by us yielded results as free from error as possible. To be able to examine the technological features of the Palaeolithic cultures of the entire Indo-Pakistan sub-continent, it was essential to handle all the important collections from the sub-continent. It was, of course, not possible to include in the present work every one of the hundreds of Palaeolithic industries that have been discovered so far. Only those industries have been selected for detailed investigation which come from stratified deposits or those which contain a good number of artefacts, i.e., not less than hundred. Among those which come from surface, only homogeneous assemblages belonging to single-culture site have been studied. These criteria of selection provide a firmer ground to our general observations which, as noted, are solely based on statistical comparisons.

Based on the above criteria a few industries are selected for detailed examination, and, in this, our guiding principle has been to select at least one industry from each important river-valley. It may be mentioned, however, that it has not been possible to do so in all the cases, and some of the river-valleys, though important, had to be left out. Several reasons are responsible for this. Sometimes the material reported consisted of only a few artefacts. In other cases, collections had to be excluded simply because they were not available to the author for one reason or the other. Some collections, even though large, had to be left out because they were badly preserved and mixed up. Thus, the material from such important regions as Raisen district in Madhya Pradesh, Mayurbhanj, Sundergarh and Dhenpanal in Orissa, Singhbhum in West Bengal and north-western part of the sub-continent lying in Pakistan could not be studied, and reliance had to be placed solely on the published works relating to these areas. On the other hand, two or more industries from one river valley had to be chosen for detailed study, simply because they showed basic difference from each other. Thus, the materials from Mahadeo-Piparia and Adamgarh, both situated in the Narmada valley, were examined in detail, as they came from very different geographical contexts and appeared to be different from each other on the basis of previous studies. A comprehensive picture of the palaeolithic finds reported so far is being given in the succeeding chapter, which also includes a brief account of the history of the finds, the stratigraphic position and the general typo-technological features of the assemblages.

After the selection of the representative collections, the classification of the artefacts posed another problem. An industry has been first divided within four broad groups, namely finished tool, core, blank and diverse.

Since this dissertation is aimed at a detailed study of the prepared core technique in palaeolithic industries of the sub-continent, the finished tools are naturally of lesser importance than the simple cores and blanks which, in fact, provide the source material for understanding technological implications. As it is difficult to evaluate an industry without referring to its finished tool-types, exact number and percentage of each implement-type have been mentioned in the beginning of the discussion on each industry.

A detailed classification of cores and blanks has been done which is based mainly on the grounds of their nature of preparation. The criterion guiding our classification is the preparation of the dorsal surface and the striking platform of the specimens. Each core and blank group has again been sub-divided on the basis of shape and size of the artefacts. These have not been given any separate names. Thus, the main divisions of cores as well as blanks correspond with each other. Attempt has also been made to find out whether the blanks of a particular group agree in shape and size with the scars appearing on the cores of the same group. Besides the above mentioned divisions, an attempt has also been made to classify the blanks on the basis of their size and general shape, which in turn depends on the nature and size of tools required to be manufactured. In the following lines we describe our method for classifying the blanks on the basis of the above considerations. We have found the method quite advantageous and it is felt that this could be used for similar studies in future.

On the grounds of secondary work, the flakes can broadly be classified into four groups, i.e., finished tools, partially retouched flakes, simple flakes and waste chips. It is the last two categories which pose the problem of identification. A clue to the probable solution of this problem is provided by the finished tools themselves. The maximum length and breadth of all the finished tools of an industry has been measured at first and then a range of the size—indices of each tool-type has been fixed. Besides, the general shape of each tool-group has also been taken note of. Thereafter, an attempt has been made to find out how many partially retouched (or worked) and simple flakes agree with the size and shape of a particular tool-group. It may be said that the flakes thus picked up were probably meant for manufacturing the tools of that particular group with which they tally and somehow they remained uncompleted. Terms like 'handaxe-flake', 'cleaver-flake' and 'scraper-flake' are used for such flakes, to denote their purpose. Among the Indian palaeolithic industries, mention may be made of Nagarjunakonda and Chirki-Nevasa industries, which are treasure-houses of cleavers and cleaver-flakes. The specimens of latter remind us of the Victoria-West technique or Para-Levallois technique but those of the former are typical of that site only.

A flake which is smaller than the biggest flake-scar appearing on the finished tools or biggest preparatory scar on cores in an industry and is devoid of any secondary work, has been regarded as a 'by-product' or 'waste-chip'. These by-products or the waste-chips are usually much smaller than those flakes of an industry which have been either converted into finished tools or were seemingly meant to be so. It has been observed that it is easier to distinguish by-products from other flakes in pebble-tool industries than in those industries which are dominated by handaxe-cleaver or similar other tool-types. In the industries of the former group the by-products are invariably similar to unprepared or partially prepared flakes. In the industries of the latter group there is a likelihood of finding two types of by-products, resulting from primary and secondary workings. It is not always possible to differentiate the by-pruducts of the first types from other flakes of an industry, since the primary flake-scars are usually not to be found on the finished tools. The by-products resulting from the secondary working can usually be identified by comparing them with the flake-scars on the finished tools and cores. Though smaller in size, they are likely to be similar to the prepared flakes and may at times resemble the Levallois flakes. The resemblance however, is only in appearance, since the technique employed here is that of a specialized type of secondary working, described as 'gleichgerichtete bearbeitung' by Bosinski (1965: 7), which is quite different from that of the Levallois. This technique has been particularly employed to prepare sharp regular edges of the handaxes and the resultant flakes are generally small in size. The size of the artefacts becomes gradually diminutive in the three phases of the Palaeolithic period and accordingly one may expect to find smaller by-products in each succeeding culture. It may be mentioned here that reason or the other. Some collections, even though large, had to be left out because they were badly preserved and mixed up. Thus, the material from such important regions as Raisen district in Madhya Pradesh, Mayurbhanj, Sundergarh and Dhenpanal in Orissa, Singhbhum in West Bengal and north-western part of the sub-continent lying in Pakistan could not be studied, and reliance had to be placed solely on the published works relating to these areas. On the other hand, two or more industries from one river valley had to be chosen for detailed study, simply because they showed basic difference from each other. Thus, the materials from Mahadeo-Piparia and Adamgarh, both situated in the Narmada valley, were examined in detail, as they came from very different geographical contexts and appeared to be different from each other on the basis of previous studies. A comprehensive picture of the palaeolithic finds reported so far is being given in the succeeding chapter, which also includes a brief account of the history of the finds, the stratigraphic position and the general typo-technological features of the assemblages.

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Since this dissertation is aimed at a detailed study of the prepared core technique in palaeolithic industries of the sub-continent, the finished tools are naturally of lesser importance than the simple cores and blanks which, in fact, provide the source material for understanding technological implications. As it is difficult to evaluate an industry without referring to its finished tool-types, exact number and percentage of each implement-type have been mentioned in the beginning of the discussion on each industry.

A detailed classification of cores and blanks has been done which is based mainly on the grounds of their nature of preparation. The criterion guiding our classification is the preparation of the dorsal surface and the striking platform of the specimens. Each core and blank group has again been sub-divided on the basis of shape and size of the artefacts. These have not been given any separate names. Thus, the main divisions of cores as well as blanks correspond with each other. Attempt has also been made to find out whether the blanks of a particular group agree in shape and size with the scars appearing on the cores of the same group. Besides the above mentioned divisions, an attempt has also been made to classify the blanks on the basis of their size and general shape, which in turn depends on the nature and size of tools required to be manufactured. In the following lines we describe our method for classifying the blanks on the basis of the above considerations. We have found the method quite advantageous and it is felt that this could be used for similar studies in future.

On the grounds of secondary work, the flakes can broadly be classified into four groups, i.e., finished tools, partially retouched flakes, simple flakes and waste chips. It is the last two categories which pose the problem of identification. A clue to the probable solution of this problem is provided by the finished tools themselves. The maximum length and breadth of all the finished tools of an industry has been measured at first and then a range of the size—indices of each tool-type has been fixed. Besides, the general shape of each tool-group has also been taken note of. Thereafter, an attempt has been made to find out how many partially retouched (or worked) and simple flakes agree with the size and shape of a particular tool-group. It may be said that the flakes thus picked up were probably meant for manufacturing the tools of that particular group with which they tally and somehow they remained uncompleted. Terms like 'handaxe-flake', 'cleaver-flake' and 'scraper-flake' are used for such flakes, to denote their purpose. Among the Indian palaeolithic industries, mention may be made of Nagarjunakonda and Chirki-Nevasa industries, which are treasure-houses of cleavers and cleaver-flakes. The specimens of latter remind us of the Victoria-West technique or Para-Levallois technique but those of the former are typical of that site only.

A flake which is smaller than the biggest flake-scar appearing on the finished tools or biggest preparatory scar on cores in an industry and is devoid of any secondary work, has been regarded as a 'by-product' or 'waste-chip'. These by-products or the waste-chips are usually much smaller than those flakes of an industry which have been either converted into finished tools or were seemingly meant to be so. It has been observed that it is easier to distinguish by-products from other flakes in pebble-tool industries than in those industries which are dominated by handaxe-cleaver or similar other tool-types. In the industries of the former group the by-products are invariably similar to unprepared or partially prepared flakes. In the industries of the latter group there is a likelihood of finding two types of by-products, resulting from primary and secondary workings. It is not always possible to differentiate the by-pruducts of the first types from other flakes of an industry, since the primary flake-scars are usually not to be found on the finished tools. The by-products resulting from the secondary working can usually be identified by comparing them with the flake-scars on the finished tools and cores. Though smaller in size, they are likely to be similar to the prepared flakes and may at times resemble the Levallois flakes. The resemblance however, is only in appearance, since the technique employed here is that of a specialized type of secondary working, described as 'gleichgerichtete bearbeitung' by Bosinski (1965: 7), which is quite different from that of the Levallois. This technique has been particularly employed to prepare sharp regular edges of the handaxes and the resultant flakes are generally small in size. The size of the artefacts becomes gradually diminutive in the three phases of the Palaeolithic period and accordingly one may expect to find smaller by-products in each succeeding culture. It may be mentioned here that this type of study is possible only in the case of collections obtained from the factory sites. A very cautious analysis may facilitate the identification of the distinctive features of by-products and intentionally detached flakes in each industry. It has to be borne in mind that the nature of the by-product will vary from industry to industry, and to a certain extent depends on the typological characteristics of the industries.

It is obvious that the blanks, cores and their scars have to be measured cautiously in such a study. The main points of measurement of an artefact are—length, breadth and thickness. Naturally one has to have fixed points for determining these dimensions. For this purpose an artefact was placed in such a way that its striking platform or bulbar end, as the case may be, was always downwards, except in the case of such finished implements as handaxes and cleavers. It has to be made clear that while studying the technological aspect of a cleaver made on flake the measurement etc., is based on the aforesaid orientation, i.e., by placing the bulbar-end downwards. But for drawing and other typological descriptions the specimen can be oriented according to its working edge. For example, the cleaver-flake obtained by the Victoria-West or Para-Levallois technique has a broad striking platform covering the longer axis of the flake. The cleaver edge is at a side which is shorter in length. Though the description of the cleaver in this case will be given as placing the working edge upwards, it will always be referred to as cleaver made on broad flake.

"The length of an artefact is the length of the narrowest rectangle into which the specimen can be fitted," and "the breadth is the breadth of the rectangle." "Thickness is the maximum measurement of right angles between the two opposite faces of an artefact" (Clark, 1963 : 48). The angle between striking platform and flake surface of a blank was another point of measurement. Goniometre was used for this purpose. The base of this instrument is placed on the striking platform and its moving arm on the flake surface, while the other end of the arm gives the reading of the angle. The arm of the goniometre has to be placed on the flake surface in such a way that the bulb of percussion (negative or positive) does not come as an obstacle. This criterion was suggested by Barnes in one of his publications (1939 : 112).

After classification and measurement of the tools, the details of each artefact were noted in a chart, which included details such as the region, name of the site, phase, material, state of preservation, measurements, preparation of dorsal surface, preparation of striking platform, type of retouch, if any, shape and any other special features. Then a few specimens from each important group were selected for drawing, made by the author herself. The symbols adopted for the purpose are those used by Bosinski (1967, cf. pl. I).

As our main observations are based upon the statistical analysis of the Indian palaeolithic material, it would be proper to mention in brief the role of statistical methods in the study of prehistoric researches and also to evaluate the views of some scholars who have successfully adopted them. Towards the end, those methods which are found suitable for the present study have been briefly discussed.

"Statistical methods are the techniques used to facilitate the interpretation of collections of quantitative or numerical data" (Blommers and Lingquist, 1960). The importance of this method for prehistoric studies is well known now. Voluminous collections, which are almost impossible to study otherwise, could be well understood in the light of percentage of the various types, typological characteristics, dimensions and indices by applying this method. "......specially since it is desired to achieve a full presentation of all the ascertainable information concerning the entire material without making the report so bulky as to be unusable" (Bohmers, 1956 : 1).

In the sphere of prehistoric studies the credit for introducing these methods goes to Bordes (1948). The subsequent adaptation of these by Bohmers (1956), Bourgan (1957) and Vertes (1960) helped in popularising these methods. In India, Malik (1966) and Misra (1967) were the first to apply these methods to the study of prehistoric collections.

As the aim of the present dissertation is very modest, only simple statistical calculations suffice our purpose. The emphasis was more on applying these methods on reliable data. The methods suggested by Bordes (1948 & 1970) and Bohmers (1956) have been used for the presentation of calculated data. A brief description of the methods and the reasons for the selection have been presented below, and this has naturally involved also an evaluation of the various methods.

Excepting one or two cases, Bordes (1970) seems to greatly prefer cumulative graphs drawn in the form of curves to show the comparative frequencies of artefact-types of two or three palaeolithic industries. In this case, the types are generally plotted on the lower horizontal axis and the frequencies on the vertical axis. However, this method is useful only for limited purpose, since not more than four lines can be drawn together, making it impossible to compare more than four cultures in a diagram. The other difficulties are, as pointed out by Bohmers, that the exact qualities of the components can be read off only with difficulty and that the sequence and number of components have too great an influence on the form of the diagram (Bohmers, 1956 : 2).

On the other hand, Bohmers has presented the results of his statistical analysis in the form of histograms. "Histograms are employed with the different values indicated by bars drawn on squared paper. Such bars, standing out plainly in black on white, are easily read and compared, even after considerable reduction" (Bohmers, 1956 : 2). Bohmer's method is useful for presenting a comparative chart of the material from a number of sites. But at the same time, if applied for comparing limited number of sites having some striking differences, it will be less impressive in comparison to a polygon drawn for the same purpose. Similarly, the general tendencies within a group of industries can be compared with the help of cumulative curves. Hence, it can be suggested that, both the polygon and cumulative curves along with histogram tell the same story and enable us to show in graphic form the techno-typological similarities or otherwise of different industries. The choice depends on the problems faced by an investigator.

TERMINOLOGY

In the following lines, we propose to discuss the terminology used by us in this thesis. It is admitted on all hands that well-defined terminology is an essential part of studies in prehistory. Since this dissertation is primarily related to a techno-typological study, the exact definitions and explanations are all the more important. We wish to draw particular attention to certain terms which have been used in the present work but are not to be found generally in the literature on Indian prehistory. The terms occurring in the following pages may be divided into three groups, i.e., terms denoting periods, tool types and techniques.

PERIODS

The periodization of Stone Age in India has been a matter of some controversy in the recent past. In the very early stages of the studies when sporadic discoveries were being made, investigators were content to assign European cultural names to their respective discoveries. Hence, the use of European terminology was current. It was realised even then that the Pleistocene-cultural conditions of this sub-continent are different from those of Europe. Burkitt accordingly used new terms for the three stages, *viz.*, Series I, II & III, for the discoveries in the area around Bombay (Caimmade and Burkitt, 1930). For quite sometime this new introduction went unnoticed. The terms gained popularity after their use by Sankalia for the Godavari-Pravara region (Sankalia, 1958). Soon they were used for the other regions outside the Godavari-Pravara basin and became quite prevalent in the prehistoric literature of the fifties. That the Indian prehistorians were not quite satisfied with these technical terms is evident from the fact that Subbarao in 1956 proposed another set of terms, *viz.*, Early, Middle and Late Stone Ages and later the suggestion was also formally accepted by the prehistorians present in the Asian Conference held at Delhi in 1961. The argument given in favour of this change was that certain gaps existed within the Pleistocene and Early Holocene cultural-sequence, specially in the context of the absence of the Upper Palaeolithic. But, even at that time, scholars like V.N. Misra expressed their disagreement with this change (Misra, 1962 : 113-24).

Recently, the Upper Palaeolithic has been recognised in precise geo-chronological sequence in several regions of India. In the light of these new discoveries the prehistorians of the sub-continent again face difficulty in adaptation of the terms Early, Middle and Late Stone Age, because there is no provision for the Upper Palaeolithic in it (cf. Agrawal and Ghosh, 1972 : 504-509). A few individual attempts have also been made to solve afresh the problem of selection of suitable terminology for Indian prehistory, such as A.K. Ghosh's proposal of 'Core', 'Flake' and 'Flake-blade' cultures for the three stages respectively. However, these terms, it is feared, will add more to the prevailing confusion.

In agreement with V.N. Misra, who has put forth well-reasoned arguments for the use of the set of terms current in Europe, we have used Lower, Middle and Upper Palaeolithic in the present dissertation.

TOOL TYPES

We propose to define clearly each tool-type, so that the reader is left in no doubt about the meaning and usage of the term used to denote a particular tool-type. This will also help subsequent workers examining the same collections. Some of the terms used in this work for certain artefact-types may appear new to an Indian student of prehistory. However, these terms have been adopted from well known works of European and American writers on the subject. A few others, though not prevalent in literature on prehistory in English, have been translated from their German and French equivalents. The original terms together with the particular text have been mentioned in the foot-notes. The artefact-types in this dissertation and their explanations are given below.

The artefacts of any industry have been classified into four broad groups, i.e., finished tools, cores, blanks and diverses. Each of the first three contains many different techno-typological types and sub-types. First, an attempt has been made to define the four macro-groups and, thereafter, their important sub-types individually.

Only those artefacts have been named as 'Finished tools' which have at least one working edge, resulting from a deliberate working. This intentional working could include both the crude-bold flaking (such as in chopper and chopping-tool) and all types of secondary working. To make the study objective we have preferred the techno-typological base to the functional base for classification.

Thus, such specimens, which have sharp edges as a result of primary flaking but do not show any sign of secondary working, have not been regarded as 'finished tools'. To cite an example, a flake having a sharp edge formed by one longitudinal preparatory scar on the half cortexed dorsal face has been described as 'knife' by many Indian prehistorians with the argument that the sharp edge of such a specimen seems to have been used for cutting purposes (Misra, 1962). We are, however, inclined to regard it a 'simple flake', since it does not satisfy the above-mentioned condition for a finished implement.

The term 'core', if used in a very broad sense, will include all such artefacts which are not blanks (flakes or blades). Hence, a finished tool made out of a nodule or a pebble is also a core, at least theoretically. But to be precise, in the present work we have decided to use the term 'core' for only such artefacts which either have definite negative scars, evidencing detached-blanks or apparent preparation for the same. Those cores which have been converted into finished tools fall out of the scope of 'Core-group', and have been included in the finished tool group.

'Blank' is a term introduced and clearly defined by Movius (1968 : 4). It is a general term, which includes both flakes and blades. The conventional use of the term 'flake' to denote a group of 'blank' on one hand and a particular type of blank on the other is confusing. The blanks which are also finished tools have been included in both the groups with a view to analysing their technological as well as typological aspects.

The term 'Diverse' was introduced by Bordes who defines it as comprising objects of ill-defined types or more often, the objects which are perfectly clear but their rarity does not permit to classify them otherwise (Bordes, 1961 : 43).[1] The present author agrees with the first half of the definition and has classified only those artefacts under this group, which do not seem to belong to any well known types. This also includes partially worked specimens which were not found suitable for making tools and hence rejected during the process of manufacture. The later part of the definition by Bordes does not appear very reasonable. The rarity or otherwise of an artefact-type in a particular culture are objects, may be cultural diverse, but typologically speaking, if an artefact fulfils all essential characteristics of a well defined tool-type, there is no reason why it should be grouped under diverse.

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1. "Ces (divers) comprendont les objects d'un type mal defini, on plus souvent, des objects parfaitement nets, mais que leur rarete ne permet pas de classer autremen".

FINISHED TOOLS

During our classification of the palaeolithic collections the following finished tool types were noticed:—

Chopper—The term has been universally adopted after Movius (1948) according to whom a thick massive unifacially worked scraper can be named as chopper. The tools of this type are made on pebbles, nodules or thick flakes.

Chopping-Tool—The type has been defined by Movius as follows : "These are tools on cores, usually made on pebbles. They are bifacial toots, the edge obtained is clearly sinuous since it has been done by alternate retouch..." (Movius, 1948 : 329-420).

Different views have been expressed with regard to the nomenclature of these two types. These have been discussed by Asok K. Ghosh in one of his recent publications (Ghosh, 1974 : 221-234). We have retained the terminology proposed by Movius as we find the same quite satisfactory.

Pebble-Scraper—As the name suggests, the type is worked on pebbles or nodules, either unifacially or bifacially. The secondary working on these specimens is small, neat and shallow as compared to that on chopper and chopping tools. Hence this group of tools has been separated from the above two.

Handaxe—It is generally oval, bifacially worked implement, having numerous sub-types (cf. Bordes, 1961 : 57-63). Here the emphasis should be laid on its bifacial working which would preclude the necessity of such awkward terms as 'Unifacial handaxe' (Mohapatra, 1962 : 64, pl. VIII, 2 & 5), 'Unifacial-Biface' (Reddy, 1968) etc.

Cleaver—This is a special type of bifacial implement, with a roughly transversal edge opposite to the base. The type is generally made on flakes but cleavers on cores are also noticed. The secondary working on the sides gives parallelogrammetic or roughly biconvex shape to the cross-section of these artefacts (Bordes, 1961 : 63-66, Fig. 10).

Discoid—It is roughly round and bificially worked implement with biconvex cross-section. Apparently it resembles a disc core but differs from it on the ground of lack of alternate flaking. The margins are also not zig-zag as is in the case of Mousterian core. The extensive secondary working on this type of tool is usually of a very advanced type, reminiscent of that appearing on the typical Upper Acheulean handaxes. The type has sometimes been considered as a handaxe (Bordes, 1961: 63).

Uniface—The term has been used for a particular type of implement made on a pebble or a noudle. One of the surfaces is thoroughly worked by removing flat small chips from the edges, and the other completely unworked. Usually it has oval plan and biconvex or plano-convex long and cross sections. The type has been sometimes named as 'unifacial handaxe' by a few Indian prehistorians. It is found frequently in the Lower Palaeolithic collections from the Peninsula.

Elongated Bifacial Implement—This bifacially worked elongated, pointed, implement, having roughly convex but zig-zaged sides-differs from other bifacially worked tools in plan, cross-section and mode of flaking. It is worked from both the sides by removing comparatively big deep alternate flakes forming central ridges on the two surfaces. It frequently occürs in the Lower Palaeolithic industries of Peninsular India but is not completely absent in the Middle Palaeolithic assemblages. Bordes has named this type 'Biface maniforme'. He also informs that these boat-shaped specimens are frequently found in African palaeolithic collections (Bordes, 1961).

Scraper—It is necessary for a specimen to have at least one retouched side or end for being called a scraper. The specimens, on which retouching does not cover at least one edge, have been grouped as partially retouched artefacts. As the name suggests, a side-scraper is retouched on one side or more sides, the angle of retouch being lower than 76°. This implement has probably the largest number of sub-types, which have individual significance in typological studies. But in the present study they may be grouped under the following broad categories—*Single* or *Simple-Side scraper*, *Double Side-scraper* (which are retouched on both the sides); *Transversal scraper* (made on a broad flake it has retouched top and is also known as wide scraper), and *Angle-scraper*. There is one more group of scrapers which includes those flakes which are retouched at high angle (76°-90°). It has been named 'Steep-scraper', after Movius (1968: 9-13). This group includes three main types, *viz.* round, end and steep side-scraper.

Blade with Marginal Retouch—The group consists of two types, i.e., blades with one or both retouched margins. The retouching on these specimens is done at an angle of less than 75°.

Backed Blade—Those blades which have blunting (or retouch at high angle ranging from 76° to 90°) on one of their margins have been grouped under this class. The Chatelperronien and Gravettien points and Pen-knife of the European Upper Palaeolithic cultures are in fact varieties of this broad group.

Point—With a few exceptions like *Blattspitze* (or leaf shaped point) this implement is made on some type of roughly triangular flake. The retouching, usually at an angle of less than 75°, appears on the two side-edges and the point, generally lying just opposite the bulbar end. In the case of Levallois points, the retouching is not an essential criterion.

Borer—They are either made on flakes or blades and rarely on cores. The point is formed by bilateral alternate retouching (Bordes, 1961: 32).

Burin—This is a very special type of implement made on blanks, occasionally on cores. To quote Movius, "In general it exhibits a relatively narrow cutting edge, normally mounted at right angles or nearly so, to the ventral plane (or the bulbar surface) of the blank on which the piece is made" (Movius, 1968: 21). He further adds that all burins involve two technological processes, *viz.* "...creation of a striking platform on the blanks from which a spall may be removed" and "the detachment of a spall or series of spalls from the spall platform" (Movius, 1968: 21). On the basis of his objective analysis he has suggested several types of burin. Such a detailed analysis was not desirable for the present work.

This roughly covers all the tool-types mentioned in this dissertation.

BLANKS

The group of blanks consists of two main types, i.e., 'the flake' and 'the blade'. The 'flake' has been defined by Movius as having "...a length less than two times the width, the sides may or may not be essentially parallel. Regularity of thickness and form and complexity of the dorsal ridge pattern can vary greatly" (Movius, 1968 : 5). And for a 'blade', he says, "A blade has a length at least two times greater than the width and has more or less parallel sides" (Movius 1968: 4).

The two groups of blanks have been classified on the consideration of the preparation of dorsal surface and the striking platform, respectively. We have intentionally classified the blanks in detail and used long descriptive terms to denote various types. This type of classification, based on technological consideration itself, is a detailed analysis of blanks and facilities intensive study. The data, thus acquired, can easily be moulded in various ways depending upon the problems confronted by a researcher. For example, the fifteen types of blanks mentioned below can easily be grouped under six heads, if one is interested in studying the preparation of the dorsal surface. On the other hand, they can be reduced to four if the point of investigation is the striking platform of the blanks. The idea of adopting descriptive terms for various blank types we owe to Tixier (1963). It was felt that this terminology will help in avoiding confusion and give a better understanding of the types and their technological characters. However, a few well defined terms as 'Levallois flake' and 'blade' etc., have been retained.

(I) Unprepared flake—The flakes of this group are completely devoid of preparation marks. That is to say the dorsal surface and striking platform in this case are cortexed (pebble surface or unworked nodule surface).

(II) Flake with unprepared dorsal surface but prepared and unfaceted striking platform—The dorsal surface of this flake type is similar to the above, but the striking platform, being prepared by single blow, shows an unfaceted, plain surface.

(III) Flake with unprepared dorsal surface and prepared and faceted striking platform—Flakes with cortexed unworked surface at the dorsal in this consist of carefully prepared striking platform having at least two facets.

(IV) Flake with partially prepared dorsal surface but unprepared striking platform—The specimens with partially prepared dorsal surface have only one or two and rarely three half negatives or preparatory scars and nearly half of the upper surface remains cortexed.

(V) Flake with partially prepared dorsal surface and prepared unfaceted striking platform—The type is self-explanatory.

(VI) Flake with partially prepared dorsal surface and prepared faceted striking platform.

(VII) Flake with prepared dorsal surface but unprepared striking platform—The flakes of this group, though having prepared dorsal surface, do not exhibit any definite pattern of preparation and thus could be classified as Levallois flakes or points. They may, however, be called 'Atypical Levallois' flakes.

(VIII) Flake with prepared dorsal surface and prepared, unfaceted striking platform.

(IX) Flake with prepared dorsal surface and prepared, faceted striking platform.

(X) Levallois flakes with unfaceted striking platform—These flakes have quite a few centrally directed half negative scars, forming a hump in the middle. The striking platform of the specimens of this group is unfaceted. The controversy regarding 'Levallois' flakes having unfaceted striking platform or otherwise has been discussed separately, at the end of this chapter.

(XI) Levallois flake with faceted striking platform—These are classical Levallois flakes.

(XII) Levallois point—These are triangular flakes obtained by a single blow on the specially prepared Levallois cores of roughly similar shape. They either have a central ridge, resulting from core preparation or a complete triangular negative scar of a previously detached point (Cf. Bordes, 1961 : Fig. 4, 1). There are only a few such pieces in Indian Palaeolithic industries and so their sub-divisions have been left out.

(XIII) Blade with unfaceted striking platform.

(XIV) Blade with faceted striking platform.

(XV) Blade with micro striking platform—This group of blade has very tiny striking platform, which is almost negligible in comparison to the prominent cone. They might be taken to evidence the application of the indirect or punch technique.

A separate category within the blanks is of *Undetermined flake*. It must be made clear that this is not a type but is precisely what its names suggests. While studying a collection, a researcher does find some flakes which are difficult to classify in any one of the aforesaid groups, either due to very extensive working or in some cases due to bad preservation etc.

Besides, in the group of blanks a portion may be termed as 'by-product' or 'waste-chip'. Though it may not always be possible to group them with confidence, we have suggested a tentative method to recognise them in the part dealing with methodology. As the name suggests, a 'by-product' or 'waste-chip' is a piece obtained during manufacture of any artefact such as an implement or a prepared core. It is comparatively smaller than the biggest scar appearing on the artefacts of an industry. Often they are unretouched and do not carry definite marks of preparation. But, in some cases, usually when they are associated with the handaxe-cleaver industries, some specimens could be found which ; though are by-products, they look like a true Levallois flake. The only difference in this case will be their unusually small size. These types of by-products are well described by Bosinski as 'gleischgerichtete bearbeitung' (Bosinski, 1965 : 7). It is quite easy to recognise by-products in the pebble tool industries, because they are comparable to the scars appearing on the chopper and chopping-tools. The intentionally detech-ed flakes associated with such industries are generally considerably bigger than the by-products. Similarly, such chips which are obtained during the retouching of an artefact are very small and are difficult to discover.

Within the groups of flakes one may find mention of 'handaxe-shaped flake' and or 'cleaver-shaped flake'. These flakes, though they seem to be detached for making the said implements, were left unworked. They are morphologically similar to the finished handaxes and cleavers made on flakes. Very promising examples of cleaver-shaped flakes were noticed in the cleaver-dominating industry of Nagarjunakonda and Chirki-Nevasa, where they mark variant technological features.

CORES

Different classifications of cores have been suggested by various scholars. The basis of this division is either technological or the shape of the cores or both. Some of these classifications appear to be less scientific, lacking clear and precise definitions, and are based on not very convincing grounds. They are so confusing that one finds difficulty, at times, in distinguishing one type from the other (Paterson, 1945 : 1-19). Like the blanks, the cores also have been classified in this dissertation solely on the grounds of technological details.

(I) Unprepared core.

(II) Core with unprepared dorsal surface but prepared striking platform.

(III) Core with partially prepared dorsal surface but unprepared striking platform.

(IV) Core with partially prepared dorsal surface and prepared striking platform.

(V) Core with prepared dorsal surface and unprepared striking platform.

(VI) Core with prepared dorsal surface and prepared striking platform. Both the last two can be named 'Atypical Levallois cores'.

(VII) Levallois core—The cores of this group are also named 'Tortoise cores'. The centrally directed preparation scars form a hump in the middle resembling the shape of a turtle back. The striking platform is generally prepared at one end of the specimens at nearly 90° angle to the dorsal surface.

(VIII) Bifacial discoidal core—It is a bifacially prepared roughly round or oval core with biconvex cross-section. The flake-scar on the two surfaces denote that the usually elongated centripetal flakes have been removed from them, alternately, after the usual Levallois type preparation. The flaking agrees perfectly with that of the discoidal Mousterian cores, but at the same time it differs from them at least on one point. The specimens of Indian Palaeolithic industries have been flaked bifacially while in the case of the European cores it is limited to the dorsal surface only (Bordes, 1961 : 72-73).

(IX) Core for detaching blades—As we have not come across many blade cores, their different types are not being given in detail. They can be grouped after their shapes and number of striking platforms, etc.

Each core and flake group is further sub-divided on the basis of their shapes. They may be round, oval, broad, elongated, triangular and irregular. A specimen is called 'round' when it has almost equal length and breadth ratio-range, i.e., from 4 : 4.5 to 4 : 3.5, and is roughly circular without forming angles. The specimens, having length-breadth ratio between 4 : 3.5 and 4 : 2.5 and with edges similar to the preceding type may be termed as oval. In the case of elongated ones, the length-breadth ratio ranges from 4 : 2.5 to 4 : 0.5, but their sides are not parallel as a rule. In the case of broad specimens breadth is more than its length and the length-breadth ratio is at least 4 : 4.5. The word triangular is usually well understood and does not require any definition. Specimens which are not covered by the above mentioned shapes may be termed as 'irregular'.

TECHNIQUE

Proper use of the terms denoting techniques like 'Clactonian', 'Levallois', 'Mousterian', etc., has been a matter of great controversy among scholars since long. The topic was under intense discussion as early as the thirties of this century, so much so that the editor of *Man* thought it useful to publish a series of opinions under the heading 'nomenclature of Palaeolithic finds from fresh regions' (*Man*, vol. 36, 1936). In the course of this discussion some scholars like Burkitt, Brien, etc., held the view that though denoting various techniques, these terms did suggest some cultural affinity (Burkitt, 1936 : 103). It was the influence of these scholars, and others like Paterson (1945 : 1-19), that a restriction on the use of well established terms like 'Levallois' etc., was proposed in regard to African Prehistoric studies, in a meeting of Pan-African-Prehistoric Congress held at Nairobi (Proceedings of the Congress, 1952 : 9). As it is clear from publications following this suggestion, the replacement of these well known terms by some new ones has created a lot of confusion in prehistoric studies. In some of the recent publications in Europe too, a plea has been made for retaining the earlier terminology, such as 'Clactonian', 'Levallois', Mousterian', etc. It has been successfully established by Bordes that all of them could be taken as indicating purely technological processes, rather than cultural affinities (Bordes, 1961 : 13). We are in agreement with Bordes' view and have used the earlier terminology in the present work.

In this volume, the crudest flake-detaching technique and the resultant flakes have been classified under 'Unprepared'. Normally the above group would be labelled as 'Clactonian'. It was, however, considered desirable to distinguish the above from the well known 'Clactonian' because the latter is characterized by massive size of flakes, having wide angle (more than 120°) between the striking platform and the ventral surface. They are said to be the result of 'Block-on-block technique', which is evident from the prominent cone of percussion borne by the specimens (Bordes, 1961 : 13). The specimens of our group of unprepared flakes do not necessarily show all these characteristics and, in fact in quite a few cases all these seem to be wanting. Under the circumstances it was found that a general name 'unprepared' will be more advantageous.

The unprepared flakes and cores have been found in varying proportions in all the three phases of Indian Palaeolithic complexes. As many as four types within this group have been noticed. They are (1) massive flakes, (2) massive flakes of cleaver shaped (well formed specimens), (3) small flakes, and (4) by-products.

The first group consists of Clactonian flakes detached by well established block-on-block technique. They are found associated with the earliest lithic industries, *viz.* pebble-tool complex of Potwar region (De Terra and Paterson, 1939) and the Lower Palaeolithic industries of the Narmada basin (Khatri, 1963 : 186). In the tradition of typical Clactonian flakes they are characterized by unprepared dorsal surface and striking platform and high angle between their striking platform and ventral surface. They are also marked by massiveness. The second group, though similar in technique and size to the preceding one, is characterised by the presence of cleaver-shaped flakes. This forms a distinguishing feature of the earliest cultural phase of the Nagarjunakonda valley (Pant and Jayaswal, 1971), and to the best of our knowledge has no comparison in India and abroad. The artefacts in the group agreed with the shape and size of the finished cleavers of this industry and there is every likelihood that the flakes were intended for converting into cleaver after a little work on the two sides. Technologically they exhibit a very striking feature. Only those boulders which showed projecting natural curvatures of cleaver shape were selected for detaching these flakes. Thereafter, a single heavy blow at the centre of the curvature was sufficient to produce a desirable flake, i.e. a broad flake having a cleaver-edge on one side (Pl. XVI, 1). Thus it may be said that even without preparation, the shape of the flake was determined before its separation from the core. These flakes also seem to be detached by Block-on-block technique, but one wonders whether they can be grouped under Clactonian flakes, for their shape was predetermined at the detaching stage.

The flakes of the third group belong to an intermediate stage in view of their size. This means that they are smaller than the above mentioned two types but at the same time bigger than the by-products of the particular industry. They are frequently found in the Lower and also in the Middle Palaeolithic industries. A sizable percentage of them is usually retouched and converted into various types of side-scrapers. The fourth group is that of the 'by-product' which occurs frequently in the pebble-tool complexes but is found in low percentage in other Old Stone Age industries. The 'Stone hammer technique', whenever applied for manufacturing crude implements like chopper, chopping-tool, etc., will produce a series of such flakes. The by-products can be distinguished from the other small flake types of an industry by applying the methods suggested previously.

It may be noticed that in the proposed classification there are three other flake types namely, flakes with unprepared dorsal surface but prepared striking platform, partially prepared flakes, and prepared flakes which deserve a few lines of explanation. If compared with some of the flakes of the typical Clactonian industries in England several specimens of the first two types may be found strikingly similar to them. The partially prepared flakes usually bear one or two half negatives on the dorsal face. It can hardly be proved that all these half negatives are marks of core preparation. But at the same time it is equally difficult to disapprove it either. Many specimens which we have grouped under the head 'Prepared flake' may be termed as Levallois flake if attempts were made to find parallels in some of the recent European publications. There are some others in this very group which seem to be the result of imperfect Levallois technique and may be termed as 'Proto-Levallois' or even 'Atypical Levallois' flakes. We have intentionally omitted the term 'Proto-Levallois' from the core and flake groupings, since it has never been properly defined and even such important publications on the subject as Bordes' monumental work on typology offer a rather poor and imperfect explanation (Bordes, 1961 : 13).

We incline to agree with Bordes when he says that 'Levallois' is one of the most misunderstood techniques. This is particularly true in the case of the African continent and the Indo-Pakistan sub-continent. The use of the term 'Levallois' in the context of the African Stone Age was dropped some time ago and it was replaced by such terms as 'faceted striking platform' and/or 'Prepared core technique'. Without examining the merits of this proposal the example was followed by quite a few scholars writing on Indian Prehistory. Bordes has successfully argued against the proposed change by showing that even in Europe the existence of an independent Levallois remained unproven. Under the circumstances, the use of the term 'Levallois' to denote a well known technique rather than a culture has every justification to commend itself (Bordes, 1961 : 14). He is right in emphasising that in reality a Levallois flake is a Levallois flake whether it is in the valley of the Indus or the Siene or the Vaal and also whether it occurs in conjunction with Mousterian, Stillbay, Soan or Neolithic. The expression 'with faceted striking platform' taken in the sense of Levallois technique is erroneous, because there are many flakes with faceted striking platforms which are not Levallois, and similarly there are Levallois flakes with plain striking platforms (Bordes, 1961 : 14). In justification of the use of the term 'Prepared core technique', it may be argued that besides 'Levallois' there are also some other types which denote a definite pattern of preparation of cores different from Levallois and these could be included under this general term.

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The big flakes such as those seemingly detached for cleavers, following the pattern of Levallois, have been named 'Para-Levallois' by Bordes (1961 : 14). In the literature on South African Prehistory they have been described as involving 'Victoria-west technique'. In India the type is noticed in the industries coming from Chirki-Nevasa and Lalitpur.

CHAPTER II

Survey of Palaeolithic Finds

The cultural remains of the Pleistocene man are now known to have come from nearly every part of the sub-continent. In this chapter it is aimed to bring-forth the integrated picture of the Pleistocene remains, in brief. To facilitate the proposed account it was found desirable to divide the entire sub-continent into various small regions. We have adopted the well known three fold division of the Indo-Pakistan sub-continent *viz.,* the Peninsula or the country lying south of the Indo-gangetic plains, the Indo-Gangetic plain and the Mountain-range of the extreme north, the Extra Peninsula. On the basis of the variant geological compositions, these three were for the first time marked by Baker (1928) and Stamp (1928) and were thereafter adopted as separated regions by Pithawala (1942) and Spate (1954). To us, the Indo-Gangetic plain is insignificant as it is devoid of palaeolithic remains. The composition and the Pleistocene potentiality of the remaining two have been mentioned in the following space. A further sub-division of each of the region within several small geographical units, bases on the river systems. Taking clues from the palaeolithic discoveries, which have invariable concentration in the river valleys, this criterion has been preferred. The importance of various river-systems here, lies in their potentialities pertaining to the cultural material and/or the Pleistocene remains, only.

THE PENINSULA

PENINSULAR INDIA is composed of the Archean, Chronockite, Dharwar and Cuddapah series. These formations are known to have formed in the Pre-Cambrian era, when there was no life on the earth (Wadia, 1957). Besides being the oldest formation, this land-mass is also very stable in its nature. For, since after its formation, though it has undergone various faultings and secular movements, its outer crust is almost unaffected by erosional and weathering activities. The southern part of this land, namely, the Deccan Plateau has general slope from south and west to east (Stamp 1950 : 176). It is because of this phenomenon that all the important rivers, except the Narmada and the Tapti, originate from the high lands and drain into the Bay of Bengal. Towards its northern limits, it is partly covered with Indo-Gangetic alluvium. Though drained by the Ganga-system the hilly tract of south Bihar and southern Uttar Pradesh are in fact extention of the Peninsula.

The Pleistocene deposits in the Peninsular India are mostly found in the form of river deposited gravels and silts with comparatively fewer deposition in rock-shelters and natural-caves. They have been mentioned in the order of south to north.

AREA LYING SOUTH OF KRISHNA BASIN

Vaigai Basin

The Peninsula is divisible within six broad regions and thirty-one small areas. It marks the southernmost boundary of the distribution of palaeolithic locales. The survey of the Vagai and Maratta basins in Madurai district by Raman of the Archaeological Survey of India, brought to light only a few Middle Palaeolithic sites (*IAR*, 1960-61 : 18), Pudukatti seems to be the important amongst all the reported sites. The assemblage from this site is made on fine grained stones *viz.*, jasper, chalcedony etc. The main two types reported by Raman are scrapper on flake, point, lunate, core and a peculiar shouldered arrowhead. The technological character of the industry according to the investigator is that the "Many of the tools show prepared platforms and betray an advanced (Levalloisean) technique of flake making" (*IAR*, 1960-61 : 18). It is not clear what exactly the investigator means by prepared platformed flakes which are not detached by Levallois technique, as both the terms are generally used for designating the same technique in much of the literature on Indian Prehistory.

Kortalayar Basin

Kortalayar basin constitutes the parts of Tiruvallur and Ponner, taluks of the, Chingleput district of Tamilnadu which are drained by the small river Kortalayar. It is believed that the Kortalayar flows at present on the ancient bed of the river Palar, which changed its course some time in Early Holocene (Foote, 1873 : 20-26).

Four terraces were noticed, for the first time, by Paterson, near the red hills, in the present valley of the river Kortalayar (De Terra and Paterson, 1939 : 327). The 100 ft high TD terrace is formed by detrital laterite. The first erosional activity in the valley cuts the first terrace. On the eroded surface a deposit of sand and gravel was made, and thus a 60 ft high terrace T1 was formed. The valley witnessed another erosion after sometime which was responsible for the formation of 20 ft high terrace T2, consisting of two layers *viz.*, gravel overlain by sand and silt. A subsequent erosion caused the formation of the youngest terrace T3, which is only 8 ft high and consists of alluvium only. Paterson (1939 : 327) and Krishnaswami 1938), are of the opinion that the four terraces of the Kortalayar valley represent the climatic fluctuations of the Pleistocene period and they can be correlated with the Mid-Pleistocene deposits of the Potwar region and the Narmada basin. On the other hand, Subbarao (1958 : 55) asserts that such a correlation should be based on the palaeontological and stratigraphical evidence and not on the feeble archaeological data. The present author agrees to the latter suggestion and regards the above correlation merely hypothetical.

It is from this region that Foote discovered the first palaeolith of the subcontinent in the lateritic deposit at Pallavaram in the year 1863 (Foote, 1916). The Manjankarani site was reported in 1932 and its material was studied by Burkitt, Cammiade and Richard (1932). Paterson and Krishnaswami made large palaeolithic collections from Vadamadurai and Attirampakkam. In the course of their survey of this region, the members of the Department of Ancient Indian History and Archaeology of the Madras University discovered a new site at Shriparanmgudu, which yielded some 'Middle-Acheulian' artefacts along with a plant fossil. An intensive exploration, followed by a series of excavations, was undertaken by the Prehistory Branch of the Archaeological Survey of India; under the leadership of K.D. Banerjee, from 1963 to 1968 (*IAR*, 1963-64 : 17; 1965-66 : 24 and1967-68 : 25). This pioneering work brought to light a number of palaeolithic sites (total number one hundred and sixty-four) including a rock-shelter at Gudiyam. The excavation at Vadamadurai, Attirampakkam and Gudiyam and others seem to reveal a clearer picture of the cultural material belonging to the different phases of the Pleistocene period of the Kortalayar basin than was possible earlier. Unfortunately, no detailed report is yet published. In the following, brief account of a few important localities is mentioned. This is based on the accounts available in the various issues of *Indian Archaeology : A Review*, and also our own examination of some of the material.

VADAMADURAI situated on the right bank of the river Kortalayar it is supposed to be the oldest palaeolithic site of the region. The artefacts have come from the terrace TD, five km. north-west of the Vadamadurai village, which is again 42 km. north-west of Madras city.

Paterson (1939) and Krishnaswami (1947 : 33-34) classified the artefacts into three groups on techno-typological grounds and patination on the artefacts. The first group comes from the boulder-conglomerate, and is devoid of laterite stains. They are further sub-divided into two groups i.e., 'A' is earlier and consists of crude implements, while the other 'B' is more evolved and may be assigned to 'Early Acheulian' phase. The artefacts of the second group exhibit marks of laterite staining and the group is typologically assignable to 'Middle-

Acheulian' according to these scholars. The last group is again free from lateritic stains and is more evolved than the preceeding ones and it belongs to the 'Upper-Acheulian' phase.

The above three-fold classification has been fully supported by the excavations conducted by Banerjee. He noticed three implementiferous horizons yielding three typologically different industries which are similar to those mentioned by Paterson and Krishnaswami.

The total number of one thousand one hundred and eighty-eight specimens obtained from the excavations, are separated on the basis of their mode of occurrence, within three industries. Industry 1 was obtained from layer (3) while 2 and 3 from layers (2) and (3), resectively.[1]

Vadamadurai-1, comprises seventy-three very rolled specimens. The whitish crust on these is a clear proof that they cannot be associated with laterite formation of the region.

Finished tools include five choppers, twenty-two chopping tools, twenty-three pebble-scrapers and ten handaxes. The workmanship of handaxes is cruder than in the other two industries. There are eight flakes including three handaxes which are also made on flakes. The pebble-tools far out number the other types including handaxes, which are only 13.7% of the total industry, while cores are altogether absent.

Vadamadurai-2, comes from the layer two. It consists of five hundred and fifteen artefacts. The total collection is made on coarse to medium grained quartzite pebbles and bears marks of laterite-staining. As per the excavator, this industry is assignable to the 'Early Acheulian' phase on typo-technological considerations (*IAR*, 1966-67 : 20-21). A detailed analysis of the two assemblages is given in the preceeding chapter.

Vadamadurai-3, shows the 'Upper Acheulian' or the 'Later Acheulian' characteristics and has been associated with layer (1). The total number of three hundred and thirteen artefacts in this case is made on medium-grained quartzite pebbles. The implements are almost fresh and have been lightly patinated into various shades of yellow, brown and red. This has also been selected for detailed analysis in the present work.

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[1] The author is grateful to Dr. K. D. Banerjee, for providing her facilities for examining the material and also the aforesaid informations.

The famous site of ATTIRAMPAKKAM has been investigated by several investigators from time to time. A sizable collection from the site was first made by Krishnaswami.[1] The mixing up of two palaeolithic tradition—the Acheulean and the Flake-culture, reported from the site, is evident from the studied collection. During Excavations at this site, Banerjee also noticed two separate horizons for the Acheulean and the 'flake tradition' (*IAR*, 1964-65 : 20). He observed that above the basal shale formation, an implementiferous clay deposit was laid. This clay was known to have yielded handaxe-cleaver complex. Overlying this, the detrital laterite layer contains post-Acheulean-flake industry. The uppermost layer of brownish silt is sterile, while microliths were picked up from the surface. We were unable to examine the material from this site in the stratified context in which it was stated to have been discovered. Hence we had to exclude this material from our detailed investigations.

On the basis of the examination of the collection handled at the Safdarjung Museum, New Delhi, it can be postulated that the Acheulean stage at the site was of advanced type and the 'flake-tradition', perhaps belonged to Mousterian phase (?). A considerable proportion of Levallois element, including Levallois-point, is accompanied by several cores evidencing Mousterian technique. The other noteworthy feature is that the implements lack profound retouching tendency.

Around the village GUDIYAM, lying in the vicinity of the Kortalayar basin, quite a few rock-shelters were habited by the palaeolothic man. An intensive work by K. D. Banerjee at three different localities has yielded various implementiferous horizons. At Gudiyam-1, which is a big shelter, a gradual development from post Acheulean to Microlithic tradition has been unearthed. But the excavator confesses that the development cannot for certain be assigned to the particular chronological horizons.

The second locality, Gudiyam-2, is situated on the slope of a field near the village (*IAR*, 1963-64 : 19). The excavation of this locality yielded two main layers *viz.*, a gravel deposit and a overlying loose brown soil. The upper layer is said to have yielded a mixed type of assemblage, comprising partially worked flakes, points, scrapers, handaxes, cleavers, and blades. According to the excavator, it is difficult to assign a definite horizon to this collection (*IAR*, 1963-64 : 19). But our analysis reveals that it is an industry having Advanced Acheulean features comparable to many other Lower Palaeolithic industries of the Peninsular India.

Locality three is situated near Srikrishnapuram village, but it has been named Gudiyam-3. The excavation of this locality has yielded an interesting stratigraphic sequence. A sterile layer of decomposed shale forms the bed, which is overlain by a 1.25 m thick laterite *murrum* deposit. This has been finally covered by a 60 cms thick pellety-laterite soil mixed with pebbles. The second and the third layers are said to have yielded two different industries (*IAR*, 1963-64 : 19). They are Late Acheulean (hereafter abbreviated GDM-3A) and an industry belonging to the transitional stage between the Late-Acheulean and the Middle Palaeolithic phases (GDM-3B).

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[1] The present author had an opportunity to examine this collection in the Safdarjung Museum of the Archaeological Survey of India, New Delhi, through the courtesy of Shri B.K. Thapter.

GDM-3A & B along with GDM-2 have been analysed in detail, as the material was available for first hand study in the Prehistory Branch of the Archaeological Survey of India, Nagpur.

The intensive survey of Eastern coast i.e., from Madras to Nellore has been recently done by K. D. Banerjee (Ref. to Sankalia, 1974 : 69). "Four such peneplains or terraces were noticed at a height of 73 m, 45 m, 30 m and 17 m respectively, from the present sea level. On the 45 m and 30 m terraces he has found tools of Early Palaeolithic, whereas tools of the Middle Palaeolithic were found on the 17 m terrace".

Araniar Basin

Araniar, a small river flows near the northern most boundary of Tamilnadu. It's basin is composed of quartzite and boulder-conglomerate of Cuddapah series (Sarvanan, 1968 : 6-13). Only two noteworthy palaeolithic sites are reported from this basin. They are—AMRIDHMANGALAM and YIGAVARIPALEM.

AMRIDHAMANGALAM was reported for the first time by Krishnaswami (Ref. to Gupta and Dutta, 1961), and re-examined by Gupta and Dutta (1961) and K. D. Banerjee (*IAR*, 1963-64 : 18). The collection made by Krishnaswami was examined by the present author in the Safdarjung Museum of the Archaeological Survey of India, New Delhi. The following typo-technological characteristics were noticed.

Handaxes dominate the finished implement group (366) forming 60.6%. It is followed by chopper-chopping-tool (13.2%) and cleaver (10.3%). Besides ovate, biface, side-scraper, the existence of point (.8%) and blade with marginal retouching (1.3%) has been noted. The assemblage is characterised by a good percentage of Levallois element (flake 26.0% and point 1.0% out of the total number of 96 blanks). There are eleven blades and seven cores for detaching blades. Besides, thirty percent of the specimens of the core group are worked in Mousterian technique while about thirteen percent in Levallois technique for detaching flakes.

The collection from Amridhamangalam was made from the surface. But, on the basis of the typo-technological considerations it seems to contain both Acheulean and Mousterian features. As it is claimed to be a single culture site by the investigators (Gupta and Dutta, 1961), can it thus be suggested, that it corresponds with the Mousterian of the Acheulean tradition of Europe.

YIGAVARIPALEM site is comparatively recent discovery and is said to have yielded implements belonging to the Middle Palaeolithic tradition (*IAR*, 1967-68 : 25).

Subernmukhi-Basin (*Chittor District*)

The Subernmukhi-system, drains a considerable portion of the Chittor district in Andhra and has revealed important Pleistocene remains. The basal composition of this area is characterised by Cuddapah series which is overlain by red soil and classified crystallines and gneiss formations. As a result of intensive survey of the region by M. L. K. Murty, remains of all the three lithic phases of the Palaeolithic period are now known (*IAR*, 1964-65 : 1; 1967-68 : 1). The stratigraphic evidence for the 'Early Stone Age', the 'Middle Stone Age', and the 'Blade-and-burin' cultures were derived from the banks of the Rallavakalan, a tributary revulet of the Subernmukhi (Murty, 1970).

The general schematic section of the region reveals the following stratigraphy :

Above the bed rock, Gravel I, bearing the 'Early Stone Age' artefacts has been noticed. It is overlain by a sterile red silt deposit, which is covered by a stratum of finer gravel (Gravel II), containing the 'Middle Stone Age' assemblage. The 'Blade and Burin' industry comes from the eroded surface of the first aggradational terrace which has been "...tentatively ascribed to the early part of Holocene or very late in the Pleistocene" (Murty, 1966 : 170).

A number of sites have been reported from the vicinity of this river (Murty, 1966 : 31). They have been divided into seven different localties, which are—Mandanapalle, Aravandalpalle, Appayyagaripalle, Agrataram, Chintapparti, Pileru, Mittapalaiyam, Chandragire, Tirupati, Timayyagunta, Yenkananayanipalle and Vedullachervu Chundi.

In this region, palaeoliths belonging to all the three phases, are made on quartzite. A typo-technological dichotomy has been suggested by Murty within the 'Early Stone Age'. This, however, could not be substantiated by our analysis of the Lower Palaeolithic material from the representative site of Vedullachervu.

Besides the said material, the later two industries belonging to the Middle and the Upper Palaeolithic phases from Vedullachervu have also been selected by us for detailed analysis.

Recently, a few caves have been excavated by Murty, in the same region. Rich Upper Palaeolithic bone and lithic industries have been brought to light (Murty, 1974). As the work is still in progress, no detailed account is available.

Pennar Basin

Originating from Chennarayantutta, the river Pennar drains Anantpur, Cuddapah and Nellore districts of Andhra Pradesh. To the best of our knowledge the upper course of the river has not yet revealed Pleistocene remains. The lower part contains traces of the palaeolithic habitation.

In 1864 Oldham for the first time discovered palaeoliths from the middle course of Pennar (Ref. to Reddy, 1968). Foote is also known to have surveyed the area in 1891 (Foote, 1914 : 146). After a considerable time gap Reddy carried out thorough investigations in this district. As a result of which twenty-seven palaeolithic sites are located in the deposits made by Sagileru and its tributary *nalas* (Reddy, 1968 : 2).

The Pleistocene deposition observed on the banks of the Sagileru is not different from that of the other parts of the tropical India. In this region also, two gravels intervened and sealed by silt deposits have been observed. The first and the second gravels have yielded artefacts of the 'Early' and the 'Middle' Stone Ages respectively, while the microliths were found from the surface (*IAR*, 1964-65 : 2). As many as six hundred and ninety artefacts were collected by Reddy from all the twenty-seven 'Early Stone Age' sites of this region. Out of these Vadamanu may be taken as representative one, for it has not only yielded specimens of both 'Early' and 'Middle' Stone Ages from different stragraphic horizons, but the assemblage from this site is also by far the largest (Reddy, 1968 : 107-20).

Manley discovered a good number of palaeoliths (Aiyappan, 1942), i.e. fourteen hundred and thirty-three from the banks of the river Pennar in Nellore district. Unfortunately no definite stratigraphical horizon could possibly be assigned to this large collection.

The tool-bearing localities have not been named after village or town but are given alphabetical names from A to Z and are also sub-numbered as 2—60. The material available to us in the Government Museum Madras, was kept together, making a locality-wise scrutiny almost impossible.

Aiyappan has studied all the artefacts together and has classified them on the basis of state of preservation, patination and techniques employed. To quote the scholar... "only when considered with technique and patination does typology give a reasonably sound basis for the study of surface collection such as the one now dealt with" (Aiyappan, 1942 : 13). He further observes that the, "Pebble-tools of Manley's collection and those from Vadamadurai are similar in typology and Patination". Since it is a collection from the surface it is obviously made of several small industries. Thus it is difficult to say anything about its nature with any amount of certainty. The use of the term, 'Pre-Stellenbosch' for the pebble-tools of the collection is unsatisfactory, since the term implies chronological consideration which is not applicable in the present case. Before drawing any conclusions regarding techno-typological nature of the assemblage it is desirable to find out whether it represents a single industry or is a hybrid collection. At present this is difficult to determine.

KRISHNA BASIN

The area surveyed by Krishna-system is quite vast and needs further screening. Taking into consideration the Pleistocene potentialities it has been grouped in the following regions—Tungbhadra valley; Malaprabha valley; Upper Krishna valley (the main stream); Bhima basin; Shorapur doab; Kurnool district; Nagarjunakonda valley and Nalgonda district.

Tungbhadra Valley

Originating from the hills of the Western Ghats, the river Tungbhadra passes through the Mysore state and joins river Krishna a few miles southeast of Nandikotpur in Kurnool district of Andhra Pradesh. Only a few implementiferous localities are known from this region, due to the lack of intensive work.

Among the noteworthy localities, the earliest ones are the four sites in the district of Shimoga, reported by Foote (Ref. to Sankalia, 1962 : 32). Detailed account of Foote's discoveries is not available. The palaeolithic locales discovered by Sheshadri in Tamkur district (*IAR*, 1955-56 : 68), are quite a few. The important site is KIBBANHALLI, which is situated on the foot hills of the Banasandra range. According to Seshadri, the Lower Palaeolithic industry of the site is of mixed nature. It has both the Abbevillian and the Acheulean artefacts along with the Clactonian technique as one of the characteristics. Levallois element is said to be absent (Seshadri, 1955 & 1956).

The discovery of NITTUR, on the bank of Tungbhadra, in Mysore state deserves a separate mention. The locality is five kilometres east of Tekkalkotta

(*IAR*, 1963-64 : 24). Not very far from the village, Ansari discovered mineralized bones of *Bos* along with a few palaeoliths. According to the investigator the assemblage is techno-typologically similar to the Soan industries of the north-western Punjab (Ansari, 1970 : 1-7). If true, this could be the southern-most site with the predominance of pebble-tools, and also, an isolated one in the midst of the so-called 'Handaxe-culture' cluster.

The small number of the Lower Palaeolithic artefacts of this site are made on coarse grained basalt pebbles. Though the collection is too small for drawing any definite conclusion, yet the striking feature of this assemblage is the existence of prepared core technique. The assemblage is essentially a part of the pebble-tool complex. This is evidenced by the presence of chopper-chopping-tool group (65.2%), bifacially prepared cores (19.2%) and the massive unprepared flakes (7.6%), in the order of frequency. An intensive investigation of the region is, thus, needed. This might reveal some important but heither to unknown features of the Palaeolithic phase.

Whatever little evidence is available, it indicates the existence of two different Lower Palaeolithic trends in the Tungbhadra Valley i.e., the one characterised by the pebble-tools and the other by handaxe-cleaver element.

On technological considerations, the two exibit an interesting paradox. The typologically cruder assemblage, dominated by pebble-tools, is associated with advanced blank-detaching techniques, while, on the other hand, the industry which is though rich in advanced tool-types, shows more frequent use of crude blank detaching techniques.

Malaprabha-Basin

The river Malaprabha originates from the Eastern Sohejadri spurs of Belgam district in Mysore state. It drains a considerable part of Bombay and Karnataka districts also.

The Pleistocene potentialities in this area was for the first time recognised by Foote (1914). But, an intensive survey was conducted here, by Joshi who brought to light twenty-one sites. All these are located on the banks of the Malaprabha and three adjoining *nalas* i.e., Benni-halla, Hire-halla and Sisive-halla (*IAR*, 1955-56 : 5). All the localities have yielded artefacts of the Lower Palaeolithic phase. Due to non-availability, the collection could not be examined.

KHYAD and MENSANGI have revealed comparatively good proportion of artefacts *viz.*, four hundred and twenty-three and two hundred and twenty-one, respectively (Joshi, 1955 : 50).

The typo-technological characteristics of the Khyad collection, according to the investigator, is mentioned below. The assemblage is said to be characterised by handaxes and cleavers made in Acheulean tradition. Both of these form more than half of the collection. Pebble-tools are also present having a considerably low proportion (16 against the total number of 423). The discoids in Joshi's account seem to by Mousterian cores, found in the Advanced Acheulean industries of the extreme south (cf. Joshi, 1955, 64-65 : 3). Besides, Joshi seems to believe that faceting of striking platform is an essential feature for Levallois technique, which is negligible in his tool-kit (Joshi, 1955 : 74). But illustrations of his publication make it clear that Levallois technique for detaching flakes was in use. He himself says that this is an "...Acheulean complex or the mixed Acheulean industry, with a high proportion of tools showing Upper Acheulean tendencies" (Joshi, 1955 : 80). It is surprising that though Advance Acheulean tendency along with Mousterian cores are present, Levallois element is unnoticed.

Upper Krishna Basin

The area under discussion is drained by the upper reaches of the river Krishna along with it's tributary, the Ghataprabha. As a result of the discovery of palaeoliths by Sankalia (*IAR*, 1955-56 : 55) from the Ghataprabha basin, Banerjee was encouraged to investigate the area in the subsequent years (*IAR*, 1956-57: 42-43). Later, the thorough survey of the upper reaches of the main stream of the Krishna and also the Ghataprabha by Pappu (1974) made Pleistocene picture of the region clearer. Banerjee was interested in the Middle Palaeolithic phase of Deccan (Banerjee 1957), with the result only the sites of this phase are mentioned in detail in his work. A number of localities around Bagalkot, have yielded more than six-hundred artefacts (Banerjee, 1957). But the collection was not available to us for first hand study.

Pappu could locate the remanicient of sixteen Lower Palaeolithic and twenty Middle Palaeolithic habitations on the banks of the Krishna and the Ghataprabha. A small tributary nala of the river Krishna named Anagwadi has yielded important Pleistocene evidence (*IAR*, 1964-65 : 55-57). An implementiferous alluvial deposit namely—cemented Gravel I was excavated, which has revealed 'Early Stone Age' tools. It was not possible to establish subphases within this deposit (*IAR*, 1964-65 : 56). The 'Middle Stone Age' implements come from a distinct stratigraphical horizon *i.e.*, sandy Gravel-II. Both these industries have been studied and included for detailed analyses. Besides Anagwadi the Middle Palaeolithic industry obtained from the openair factory-site KOVALLI has also been studied in detail, for two reasons. Firstly, it has also revealed a good number of artefacts (2720) and secondly, the mode of occurrence of this industry is different from Anagwadi-2.

To the best of our knowledge the Upper Palaeolithic phases is so far unknown in this region.

Bhima-Basin

The area drained by Bhima and its tributaries—the Sina, the Nira, the Ghod, the Mula and the Mutha lies in the south-western part of Maharashtra and Northern Mysore. Lying above the basal formation of Archuean system, the Pleistocene deposits are found in the form of the two gravels intervened by silt deposits. The rivers Ghod, Mula and Bhima have revealed mostly remains of the Middle Palaeolithic phase, with only a few stray finds of the Early Stone Age.

Though a section was observed in 1956-57 on the bank of the Mula-Mutha river at Poona (*IAR*, 1956-57 : 78), no Lower Palaeolithic tool was found in it. Next year Sankalia discovered a small chopper near the Bandh Garden at Poona (*IAR*, 1957-58 : 68). Besides this, only a few specimens of the Lower Palaeolithic tradition were obtained from the Gravel I of the region *i.e.*, Khed, Pandharpur, Sikarpur (*IAR*, 1957-58 : 67), Chandoli, Dattawadi (*IAR*, 1962-63 : 15), and a few in the Satara district.

The main Middle Palaeolithic sites of the area are Koregaon (Sankalia, 1962 : 79), Bundh Garden (*IAR*, 1957-58 : 67), Dattawadi and Vithalwadi (Rajguru, 197) etc. The implements are made on fine grained stones *viz.*, jasper, chert chalcedony etc., and are characterised by scrapers, points borers etc. Recently due to the efforts of Sankalia and Rajguru four samples have been dated by Radiocarbon method. The samples were obtained from Paithan, Inamgaon, Dhom dam and Mula dam and their dates range between 38,000 B.C. to 20,000 B.C. (Agrawal and Kusumgar, 1974 : 41-43).

Shorapur Doab

The roughly triangular area of Shorapur doab is bounded by the river Krishna on the south, Bijapur district on the west and the river Bhima on the north-east. Before the investigations by Paddaya (1968), Soundra and Seshadri picked up a few palaeoliths from the area (*IAR* 1960-61 : 64).

The thorough survey by Paddaya revealed that the earliest palaeolithic industry of the region belongs to the 'Middle Stone Age' as till... "the moment nothing is known to the remains of Early Stone Age" (Paddaya 1968 : 5). The Middle Stone Age implements have been obtained from 'high level gravels', which is overlain by 'black-brown silt'. The later formation marks the horizon of 'Blade-industry' (Paddaya, 1968 : 24-25), and microliths are scattered on the surface.

Eight Middle Palaeolithic openair workshop sites have been noticed by the investigators. A small trench (4′×4′) was dug at SALVADGI which yielded seven hundred and sixty-seven artefacts. These could not, however, bring out any definite startagraphic horizon. Paddaya has classified them on the basis of typo-technological considerations only. This is not of much use to the present study. Hence, this material has been excluded. Instead TAMKUR, a group of artefacts obtained from the surface of a single culture site has been included.

The evidence for the Upper Palaeolithic or the 'Blade-burin industry' was noticed at two places—SALVADGI and MERALBHABI. At both the localities they are said to be mixed up with the 'Middle Stone Age' assemblages. Their separation within two, bases on the occurrence of flake and blade element (Paddaya, 1970 : 166-68) which cannot be accepted without doubt. This position forbids us to include these industries for study in detail, although the material was examined at the Deccan College.

Kurnool District

This area is drained by a few southern tributaries of the river Krishna. Most important of these tributaries is the Hindri. The area was thoroughly surveyed by Issac (1960) and later on by a team of the Atlas Branch of the Archaeological Survey of India (*IAR*, 1967-68 : 5-6).

Like other parts of the sub-continent, the Pleistocene stratigraphy of this region also consists of implementiferous gravels yielding the Lower and the Middle Palaeolithic assemblages. These two gravels are separated by silt layer (Issac, 1960). The two industries are named Series I and Series II. Issac's Series III is a typical 'blade-burin' culture which was obtained either from the surface of the fields or from the gravel deposits lying loose in the river bed. According to the investigator the implements of the later tradition were also found in association with the Middle Stone Age or Series II tools.

Each of the several palaeolithic localties in the area surveyed by Issac has yielded only a few implements. Thus, on the basis of typological characteristics, the entire collection was classified within three groups *i.e.*, Series I, Series II and III (Issac, 1960). The collection was examined by us in the Deccan College, Poona, by the courtesy of Prof. Sanaklia. As it was not possible to study them site-wise the observations made by the present author are of very general nature and are as follows :

The group of Series I implements, on typological considerations is akin to Advanced Acheulean tradition. The prepondering position of handaxe (46.5%)

and cleaver (12%) is accompanied by good percentage of Levallois element (35%). There are a limited number of Mousterian cores as well.

In contrast to Series I, which are invariably made on quartzite pebbles and chunks, the tool-kit of Series II is made out of finer material such as chert and agate. The frequent type in this is a number of side-scrapers. But the earlier tradition of handaxe-cleaver element also persists, though in very low percentage (3.6 to 5%). Most of the flakes are detached by Levallois and Proto-Levallois techniques. Techniques for obtaining Levallois points and blades were also introduced.

All the artefacts of Series III were made out of fine grained stones only. It is interesting to note the presence of a few small oval bifacially worked points. Notching in implements is also very frequent. Steep retouching predominates and can be noticed on end and round scrapers and backed blades. Points and burins seem to occupy a good percentage in this group.

As far as core types are concerned, only two small Mousterian cores and a few blade cores were noticed. But the blank group comprises all the types of flakes and blades. Prepared flakes are abundant with a good percentage of Levallois element. Blades are very frequent. The length of the blades ranges between 40 and 90 mm and their thickness between 6 and 25 mm.

In general, the assemblage does not seem to be very evolved and can perhaps be assigned to the early phase of the Upper Palaeolithic tradition.

Nagarjunakonda Valley

The valley of Nagarjunakonda is situated at Lat. 16°31′N and Long. 79°14′E, in Paland taluk of Guntur district in Andhra Pradesh.

In 1955, Soundara Rajan noticed the material remains of prehistoric man in the valley for the first time (*IAR*, 1955-56 : 68; also Soundara Rajan 1958). Subsequent explorations and excavations conducted in the valley have brought to light a number of Stone Age industries (*IAR*, 1956-57 : 35; 1957-58 : 1; 1959-60 : 5-6; 1960-61 ; 1961-62 : 1 and also Subrahmaniyam *et al*. 1975) Our observations are based on the material obtained from the later investigations lying in the Prehistory Branch of the Archaeological Survey of India, Nagpur. It was made available to the author by the kind courtesy of Dr. K. D. Banerjee.

The artefacts come from five different localities which have been grouped into four assemblages on techno-typological as well as stratigraphical considerations. Two of them can be assigned to the Lower Palaeolithic phase, and the remaining two belong to the Middle Palaeolithic phase. All the four have been included for detailed investigations.

A 'blade-industry' is also reported from the region by Sankalia (1974). But the presence of this industry has not been reported in the recently published report (Subrahmanyam *et. al.* 1975). There is a likelyhood that the blades referred to by Sankalia are the same which are associated with the 'Middle Stone Age' industry of the investigators and Industry-4 of our analysis.

Nalgonda District

Nalgonda district is in Andhra Pradesh and is drained by the Krishna system. The investigations by Rao, has brought to light two implementiferous gravels, in the said drainage (Rao, 1966). Both these gravels have revealed 'Early' and 'Middle' Stone Age implements. Evidence for the Upper Palaeolithic phase is not yet known from this region.

A number of localities have yielded two hundred and fifty 'Early Stone Age' implements, which were studied as an assemblage by Rao (1966). As none of these localities has revealed sufficient number of tools, we can only mention some of the general typo-technological characteristics of these. The collection is typo-technologically similar to other handaxe-cleaver assemblages of the Peninsular, as here too, handaxes and cleavers made in Acheulean tradition occur with a considerable proportion of Levallois and Mousterian techniques.

Rao has reported ten 'Middle Stone Age' implementiferous localities, among which RAMATIRTHAMPARA has revealed three hundred and ninety tools. These were available for personal examination in the Deccan College Poona. This assemblage has been included in the group of representative collections of the Middle Palaeolithic and has been accordingly analysed in detail.

GODAVARI BASIN

The Godavari system is located within the states of Maharashtra and Andhra. Pleistocene remains are reported from the upper course of the main river, the Pravara and the Wainganga. The later two are tributaries of the river Godavari. As the palaeolithic-locale cluster is formed around Gangapur and Nasik, the yield from the upper course of the Godavari shall be discussed under Gangapur-Nasik group. Similarly Nevasa-Chirki group includes the finds from the Pravara basin.

Gangapur-Nasik Group or the Upper Godavari Basin

Gangapur is a small village at the junction of the river Godavari with Kas, and is about ten miles north-west of Nasik in Maharashtra. The Pleistocene sequence noticed by Sankalia (1952) is as follows :

The bed rock is overlain by a brown clay. Two layers of gravel *i.e.*, the coarse lower and the fine upper, is intervened by a sterile layer of silt. The gravels are implementiferous.

From three different localities, a total number of sixty-five palaeoliths were obtained. Fashioned out of basalt lumps the assemblage seems to bear Advanced to Late Abbevilleo-Acheulean features. Only one massive Levallois flake was recovered from Gravel II. Besides, the remaining sixty-four are classified into—handaxe, point, chopper (?), scraper, cleaver and Clactonian flake by the investigator (Sankalia, 1952 : 3-9). There are also two 'blade-like flakes'. In order to determine the relative chronology, Sankalia has considered the general typo-technological characters of this group and has compared them with that of Olduvia Gorge Industry. This approach is of doubtful value and not much reliance can be placed on it.

A number of the Middle Palaeolithic localities are reported from this area. Noteworthy among these are Belpandhare, Suregaon, Kalegaon and Nundur-Madhmeshwar (Sankalia, 1944). Implements were obtained from the second gravel which is sandy. Made on fine grained stones such as—jasper, chert, agate etc., the assemblages are characterised by various types of side scrapers, points, borer etc. Evidence for advance blank-detaching techniques is limited in these (Sankalia and Banerjee, 1958 : 150-60).

Nevasa-Chirki group

The basin of the river Pravara around Nevasa (19°13′ Lat. and 74°50′ Long.) is one of the best known palaeolith-yielding areas. In 1954 while excavations at the Chalcolithic mound were in progress, Sankalia realised the Pleistocene potentialities of the area. At five localities palaeolithic remains were found (*IAR*, 1954-55 : 5; 1955-56 : 4-5). All of these are near the Chalcolithic mound. Another area was brought to light by Corvinus which is about two miles down stream from Nevasa. Here a small stream Chirki has traversed Pleistocene sediments. Excavations of basal gravel yielded cultural debris of the Mid-Pleistocene period.

The cliff section along with the Pravara around Nevasa shows the following Pleistocene stratigraphy :

The bed-rock is covered by cemented Gravel I, which has yielded Series I tools along with faunal evidence of *Bos namadicus*. This gravel deposit is covered by a silt layer which is eroded at many points, and this eroded surface is overlain by compartively loose gravel. This Gravel II has yielded Series II tools. Above this layer are found yellow silt, fine gravel, yellow or brown silt and black soil layers, which served as the base for the Chalcolithic habitation. All the layers overlying the Gravel II are sterile (Sankalia, 1960 : 75; *IAR*, 1967-68 : 31-32).

Only one hundred and two Lower Palaeolithic or Series I tools come from the three localities of Nevasa. The artefacts from these localties and the Chirkinala are similar to each other from stratigraphic as well as typological considerations. The artefacts from Nevasa are too few for a comparative study (Sankalia, 1960 : 76-101). Those recovered from the Chirkinala Lower Palaeolithic horizon have been studied in detail.

The excavations at Chirkinala by Corvinus, (*IAR*, 1966-67; 1967-68 : 31-32), brought to light almost similar stratigraphy which has been discussed above, and a good number of Lower Palaeolithic artefacts. The tool-kit filled by Carvinus through the digging of the conglomerate was made available to us, in the Deccan College, Poona. Detail techno-typological account of it has been mentioned in the subsequent chapter.

The Middle Palaeolithic phase in India was for the first time recognised at Nevasa. This assemblage was thus named 'Nevasian' by the Investigator (Sankalia, 1960 : 102-114). Thereafter, similar assemblages were discovered in the region under discussion. The implements of this tradition are scattered on the surface of hillocks, which are formed by the erosion of sandy Gravel II. The noteworthy feature in this is the fact that not a single genuine tool could be recovered from the core of these hillocks. The excavation at one of such locality in the vicinity of Chirkinala has yielded it (*IAR*, 19)[1]

The following study is based on the report of the investigator (Sankalia, 1960), for, the author was unfortunately not able to examine the material herself.

The raw material used for the industry consists of fine grained stones like chert, agate and jasper. Out of the total number of six-hundred and seventeen artefacts, fifty percent (309) are rejects and the remaining three hundred and eight are regular tools (Sankalia, 1960 : 109). The following tool-types have been identified by Sankalia.

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[1] The author had also an opportunity to visit the site in December. 1969 by the courtesy of Prof. H. D. Sankalia. Digging at the locality was in progress at that time.

Points, eighteen in number, form 6.9% of the regular types. Scrapers are eighty-two (26.6%), borers twenty-one (7.0%), scraper-borers three (1.0%), flakes one hundred and fourteen (37.0%), cores sixty-seven (21.0%) and there is only one worked nodule. Sankalia has mentioned some genuine blades in one of his earlier publications (Sankalia, 1956 : 47), but none in the later one on which our present study depends (Sankalia, 1960). Though this report does not contain any technological detail of cores and flakes, a brief account is available in the earlier account (Sankalia, 1956 : 49). According to this account three types of cores were recognised. They are (a) Clactonian (b) core worked on both sides with deep flake-scars and (c) Discoidal cores.

Many different types of flakes have been noticed *viz.*, flakes with unprepared or prepared dorsal surface and prepared striking platform and Levallois flakes. Faceting of striking platform also seems to be quite common in the industry. The Levallois flakes are 3.3% of the industry. According to Sankalia, "the majority of the tools, on the other hand, show a peculiar mixture of free flaking or percussion by soft cylinder hammer" (Sankalia, 1960 : 106). Pressure flaking is seen, though rarely.

A blade tool assemblage is also reported from Ahmednagar district, Maharashtra by Nagar (1970: 307-10). This indicates the existence of the Upper Palaeolithic man also. But, not much is known about this phase of the area.

Wainganga Basin

Since 1959 the basin of the Wainganga is known to have yielded Middle Palaeolithic artefacts *i.e.*, Wainganga 'A' and 'B' (Joshi, 1966). But it was in 1970 when Joshi, in a survey of the middle Wainganga basin, around Pauni (in the Bhandra district of Maharashtra State), discovered Lower Palaeolithic artefacts from the geological section, for the first time (Joshi, 1970 : 1-2). Two localities namely—Suleman Tekri and Nimthora were discovered on the adjoining nalas near Pauni. The following stratigraphy was noticed at the place.

The lower most shale formation is overlain by a deposit of about one and a half meter thick yellow gravel. This lower gravel has yielded eleven 'Early Stone Age' artefacts, and is capped by a dark brown laterite deposit. This 'pisolithic lateritic gravel' is devoid of artefacts. The whole deposit is finally covered by a thin layer of yellow soil.

Although the total number of artefacts discovered is smaller, the collection is important for it establishes the occurrence of 'Early Stone Age' remains in the valley. It is different from the previously reported industries of the region. Joshi holds, "...as far as the raw material is concerned the handaxe industries of the Wainganga region are made of quartzite and not of chert which is generally the raw material used for both the Wainganga 'A' and 'B' types" (1973 : 3). Unfortunately a detailed account of the artefacts is not available.

'Wainganga A' is a Middle Palaeolithic assemblage according to Joshi and Allchin, where as 'B' is named 'Late Middle Stone Age 'by Allchin (1959 : 1-36) and Upper Palaeolithic by Joshi (1966). Both of these were obtained from the upper course of the river.

The Pleistocene deposits are in the form of two gravels intervened by a silt deposit. The lower gravel (I), which has yielded 'Wainganga A industry' has been noticed at the localities Bandal, Chopra and Snakkera (Joshi 1966 : 276-80).

The total number of artefacts from all the three localities are eighty-eight. These are made on chert and jasper nodules. Most of the finished tools are made on blanks, for the proportion of tools made on core : blanks is 1 : 3. The most common tool-type is point followed by side-scraper on core and flake. Angle-scrapers are also quite frequent. Though there is only one end-scraper, burins form 4.1% of the finished tool group. Only two types of cores were found—core with partial preparation and discoidal bifacial core. Levallois element is conspicuously absent in Wainganga, but blades are present in sufficient proportion. The present observations are based on the authors' first hand study of the material, which was made available to her by the courtesy of Dr. R. V. Joshi in the Prehistory Branch of the Archaeological Survey of India, Nagpur.

In the present state of our knowledge it can be assumed that two cultural groups were confined to two different regions. The upper reaches of the basin is reported to have yielded two phases of Middle Stone Age (Wainganga A and B) and is devoid of Early Stone Age, whereas the middle Wainganga basin exhibits earlier tradition with a complete absence of the Middle Palaeolithic cultural remains.

TAPTI-BASIN

The area drained by Tapti has only recently received attention of the scholars working in the Pleistocene studies of this sub-continent. Leaving aside a few sporadic discoveries of the Middle Palaeolithic localities (*IAR*, 1956-57: 11; 1960-61; 63-64) no detailed investigation was undertaken till recently. Two areas are undergoing an exploratory investigation, by Bhoperdikar and Sali. They are, the Purna basin and the district of Dhulia (Maharashtra), in the central Tapti Basin.

The discoveries made in Purna basin, have been reported briefly (Bhoperdikar, 1970 : 8-11). The Purna, a major tributary of Tapti originates from the southern slopes of Gowilegarh hills and draining the districts of Amraoti, Akola, Buldhana and Jalgaon (all in Maharashtra state) discharges in the river Tapti, near Changdev. The lower course around the confluence of this river with Tapti bas revealed three fold lithic sequence.

Around MANEGAON, the deposit traversed by the Ganga nala is as follows : The Deccan Trap, is ovelain by cemented pebble-conglomerate which contains Acheulean tools. "The intermediate level, about six meters above the river bed is marked by sandy deposits yielding Middle Stone Age artefacts, while the top most layer has revealed microliths. The composition of the last one is of light brown silt with calcareous nodules" (Bhoperdikar, 1970 : 8-11).

The total number of Lower palaeolithic implements comes to fifteen. The typo-technological features of this assemblage conforms to the 'Early and Middle Acheulian' tradition. Though handaxe could not be recovered, the main types are ovates, cleavers which mark the characteristic of Acheulean tradition. The assemblage is made out of trap chunks.

The number of Middle Palaeolithic tool is also small. The typological features of the group is, scraper-point element as the chief component. The assemblage is made on chalcedony and chert (Bhoperdikar, 1970 : 11). The mention of factory sites in the vicinity of Manegaon and Edlabad, is not substantiated with a detailed account. They seem to belong to the Middle Palaeolithic phase on typo-technological considerations, (Boperdikar, 1970 : 11).

The central part of the Tapti basin coming, in the district of DHULIA, has been surveyed by Sali, during the last few years. As the result of systematic survey, he has brought to light a number of palaeölith-yielding localities of all the three phases *viz.*, Lower, Middle and Upper Palaeolithic (*IAR*, 1967-68 : 32-33, 1969-70 : 22-24). The district of Dhulia (Lat. 20°40′—22°00 N and Long. 73°35′—75°10′ E) is the north-western corner of Maharashtra State. Besides yielding the rich Middle Palaeolithic implements, the significance of the area lies in the discovery of several sub-phases within the Upper Palaeolithic remains.

The geological composition of the area, constitutes seventeen layers. The basalt bed-rock (17th layer) is superimposed by sandy pebbly gravel. The next layer (15th.) is made of red clay (*kankary*), which has yielded 'Early Stone Age' implements.

In between this and the fourteenth layer an unconformity was noticed. The sandy pebbly-gravel, (13th. layer) at places partly re-deposited, contain 'Middle Stone Age' and Advanced Acheulean tools. Thereafter, a succession of two barren layers *i.e.,* (13th.) chocolate/brown fissured clay and (12th.) fossil soil like black/brown horizon, has been recorded. Layer 11, which has yielded 'Early Stone Age' artefacts, is composed of 'sandy fine gravel with bouldary elements at places'. This is covered by a pink/yellow calcareous silt. The investigator has recorded the evidence of tectonic movements subsequent to the deposition of aforesaid layer (10). In the succeeding layer (9), mixed assemblage of 'Early' and 'Middle' Stone Age has been discovered. This layer is formed by gravel, and, at places contained fossil soil like deposit. The brown silty clay (8) has been associated with Upper Palaeolithic A and 'Middle Stone Age' material. The other two layers lying one after the other are composed of sandyfine gravel (at places local unconformity) and yellow calcareous silt and have revealed tools of Upper Palaeolithic B I and B II respectively. The remaining five layers have been associated with the different phases of 'Late Stone Age' (Sali, 1973 : 96-104). A brief account of the Upper Palaeolithic material was available in the form of a paper contributed by Sali in the Seminar on Indian Prehistory, 1974 held at Poona.

The interpretation of the evidence of faulting and folding in terms of tectonic movements by Sali, has raised certain doubts (mentioned in *Radiocarbon & Indian Archaeology,* 1973 : 104).

WESTERN COAST : KONKAN AND GUJARAT

Kankan

This area includes a small narrow strip of the costal land of Maharashtra. The area around Bombay was under investigation, since 1932 (Todd, 1939). But the area lying south of Bombay has not received much attention from the prehistorians. Only in recent years, R. V. Joshi explored the district of Kolaba, with a view to find out the prehistoric potentialities of the area (Joshi and Boderkikar, 1972).

The complete sequence of Stone Age series, around Khandivili which was claimed by Todd, has raised doubts. According to Todd, the contents of the seven to ten feet high schematic section is as follows. The first implementiferous layer, lies over the bed-rock. This has revealed an assemblage characterised by Clactonian flakes. The next deposit is that of lower gravel which has yielded Chellean tools associated with a few Clactonian flakes. This deposit is superimposed by middle clay, upper gravel and upper clay which yielded in that order, Acheulean, flake and blade-burin industries. The microliths were picked up from the top (Todd, 1939).

The survey of the same place, latter by Malik (1957; *IAR*, 1957-58 : 78) and Sankalia (1961 : 47; *IAR*, 1960-61 ; 22), could not yield a single 'Early Stone Age' implement.

A multi-disciplinary survey of the region in the recent years, by Guzder was aimed at examining "Changes in tool technology from the ESA, through the MSA, to the LSA, should have some causal factors behind them. Can we, therefore, by reconstructing the climate and ecology of early man in this area, find if any correlation existed between the changes in technology and changes in the environment ?" (Agrawal *et. al.*, 1973 : 5). Accounts on the detailed analysis of Late Pleistocene and Holocene sedimentology, ecology etc., are though available (Agrawal and Guzder, 1971 and Vishnu-Mittre and Guzder, 1971), the details of archaeological data are still lacking.

As mentioned earlier the area lying south of Bombay was surveyed by Joshi with the aim of tracing Pleistocene deposits and the palaeolithic remains. A small assemblage comprising unifacial choppers, proto-handaxes and flakes, has been reported from Ganshari basin in between Pachad and Mahad (*IAR*, 1969-70 : 23). The Middle Palaeolithic implements are only two and are made on chert (Joshi and Boderdikar, 1972 : 47-57).

Gujarat

The state of Gujarat is served by a number of rivers. Important among these are the Mahi and the Sabarmati. Before taking up the basins of the two, it is proposed to discuss the palaeolithic finds from Karjan and Orsang basins, in brief.

The river Karjan is a small thributary of the river Narmada and drains the upper part of south Gujarat. Palaeoliths have been reported from the junction of 20′ thick alluvial and the underlying gravel deposit (of approximately similar thickness). Though the team of the 1941, expedition could not visit the area yet, atleast one implementiferous locality was noticed by Sankalia (1946). The site is near the village Ramgadh, which is two and a half miles south-west of Nandod (Rajpipla-survey map no. 46 G/9 & 13). About fourteen palaeoliths were discovered from this locality. All are made of trap except one which is made of fine grained quartzite. The assemblage comprises of pebble-tools, handaxes, cleavers and flakes. Sankalia calls it 'Late Acheulian' and is of the opinion that,..."All these tools recall the characteristics in form and technique of the tools from the Attirampakkam Terrace and the Late Acheulian tools from Europe" (Sankalia, 1946 : 319). As is evident from the two cleavers made on Levallois flakes the technique was well known to the prehistoric man of the basin.

The river Orsang along with its two tributaries the Unch and the Heran, drains into the river Narmada. The oldest formation of the basin is the granite and gneiss outcrops of the Archaean series. Taking clues from Foote's discoveries (Foote, 1914), the first Gujarat expedition included this area for investigations. The team noticed a section near Bahadurpur (73°37′ and 22°19′), on the bank of Kundya nala (a tributary nala of the river Orsang). At this place under a deposit of 25′ thickness (alluvial), a gravel layer of similar thickness was seen (Sankalia, 1946). The latter yielded at least thirty seven palaeoliths made of quartz and quartzite and trap. On the basis of the condition of artefacts the assemblage has been classified into three groups, rolled, semi-rolled and fresh (Sankalia, 1946). To quote the investigator, "the old Orsan gravel bed has given a mixed type of industry, crude and comprising handaxes, choppers, discoids and flakes" (Sankalia, 1946 : 48). The assemblage consists of fifteen handaxes, six choppers, two discoids and fourteen flakes. "Thus even in the Orsang valley a high degree of perfection in flaking technique was reached by the time of the gravel deposition" (Sankalia, 1946 : 103).

The Mahi and Sabarmati are two important rivers of Gujarat which drain the north and central part of the state. The earlier survey of the area yielded only Lower Palaeolithic material, whereas a few Middle Palaeolithic localities were discovered in the district of Kaira and the Central Saurashtra, in the later years.

The river Mahi originates from the Dhar district of Madhya Pradesh. The area of Gujarat, which is traversed by it comprises the district of Panchmahal, Kaira and Baroda. The stretch of land from Vasad to Jalampur has revealed palaeolithic localities (Sankalia, 1946). The Pleistocene stratigraphy of the basin is said to be similar to Sabarmati basin (Zeuner, 1950 : 25-27). The loss of the descriptive archaeological as well as the geological data, from the basin could not either be compensated with the present author, due to the unfortunate reasons of unavailability of the material obtained from the region, for first hand examination.

The Sabarmati is one of the major rivers of North Gujarat. "It rises under the name of 'Sabar', in the South-Western spurs of the Aravalli hills, near the temple of Amba Bhavani in the Danta State" (Sankalia, 1946), and falls into the Bay of Cambay. The river action and weathering in the basin have exposed the three geological formations which were a feature of whole of North Gujarat during the Pre-Pleistocene period. Sankalia has named the three series as 'Pre-Sabarmati', 'Sabarmati' and 'Post-Sabarmati' stages. The 'Pre-Sabarmati' stage is represented by the ancient formation of Archean, Dharwar, Marine createaceous and laterite formations of the Palaeozoic and Eocene period. The 'Sabarmati' stage comprises recent Pleistocene deposit by the river in the form of gravel and old alluvium. And the 'Post-Sabarmati' stage consists of wind-blown loam and sand formations of the Holocene period. It is the 'Sabarmati' stage which has yielded the remains of Palaeolithic man. The Pleistocene and Holocene schematic section of the basin consists of eleven different layers. They have been marked from P to Z and are said to indicate the wet and dry phases of the climatic cycle (Zeuner, 1950). The lower five layers *i.e.*, laterite, mottled clay, cemented gravel, silt and red soil, were formed in the Pleistoce period. The main tool-bearing deposits are the lower gravel comglomerate, the overlying silt and the junction of the two (Sankalia, 1946).

Taking clue from Foot's discovery (1916 : 135-451), the investigations conducted in the area, inbetween the years 1941 and 1949 have revealed a number of palaeolithic settlements (Sankalia, 1946 and Zeuner, 1950). The observations on the typo-technological features of the palaeoliths, are based on the account provided by Sankalia (1946 and 1962) who was a member of the expedition and responsible for the discoveries.

The concentration of the palaeolithic localities is inbetween the Warsora and Goda, situated in the middle course of the river. In the cluster of a number of sites *viz.*, Valsana, Kampur, Phudera, Korole, Hadol, Hirapura, Bankikot-Sadolia, the largest collection comes from Pedhamli. Situated at Long. 72°52′ and Lat. 23°40′ it was brought to notice for the first time by Foote (1916). The collection made by the team of first Gujarat expedition, comprises one hundred and eighty-one implements (Sankalia, 1946). These are obtained from three different geological horizons *i.e.*, the boulder-conglomerate (43), the junction of the boulder and the overlying silt (55), and the silt (83). Handaxes, cleavers, pebble-tools, scrapers and flakes are included in the assemblages.

On technological features of the industry Sankalia feels that 'no real evolution in form and technique is visible' (Sankalia, 1946 : 37). Describing the main characteristics of Sabarmati palaeoliths, he writes, "For the present it can be said that two main types Chellean (or Abbevillian)—Acheulean and Late Acheulean types of stone Age industries......" have been found which have been dated to Middle Pleistocene (Sankalia, 1946 : 132).

The Middle Palaeolithic assemblages have been reported from the basin of Hohar river, in the district of Kaira. Sounder Rajan has reported about thirty artefacts, found *in situ* from a fine gravel which has been assigned to Mid-Pleistocene (Sounder Rajan, 1960). The artefacts are made of chert and agate. According to Sankalia the occurrence of 'fluted cores' in the assemblage may, signify that this is a mixed lot (Sankalia, 1962 : 119).

A number of Middle Palaeolithic localities have been reported by P. P. Pandeya from Saurashtra (*IAR*, 1957-58 : 18; 1958-59 : 69). But neither a detailed account of the assemblages has been published, nor the author could get an opportunity to study them. In Central Saurashtra, from the banks of the Bhadar river, Sankalia picked up five scrapers and flakes near Jetpur. The artefacts made on chert and jasper have been associated with the cemented gravel of the area (Sankalia, 1962 : 120).

NARMADA BASIN AND RAISEN DISTRICT

It is one of the best known areas in the sub-continent for its yield of a large number of Pleistocene faunal remains along with palaeoliths.

Narmada Basin

The river Narmada originates from Amarkantak, a place in the Maikal range in the district Mandala of Madhya Pradesh, and running east to west empties into the gulf of Cambay.

The underlying Deccan trap with a number of small detached siliceous and sandstone outcrops has been eroded (Wadia, 1957 : 286). This erosion can be noticed particularly in the upper valley, where a deep rock basin has been formed, which was filled during the Pleistocene period by a five hundred feet thick ancient alluvium deposit (De Terra and Paterson, 1939).

The first palaeolith along with mammal fossils was picked up in 1873 from Bhutra. But it was in 1935 when for the first time a proper investigation of the area was undertaken by De Terra and Paterson (1939). The area lying between Hoshangabad and Narsinghpur was selected by this team for detailed investigations. Fifteen years later the lower basin was surveyed by Zeuner (1950). Later Sankalia and Subbarao studied the neighbouring areas of Maheshwar and Mandaleshwar in the West Nimar district (Sankalia *et al.*, 1958). Joshi (*IAR*, 1957-58 : 30) and Sen (*IAR*, 1960-61 : 15) also paid short visits to the area. In the year 1960, Kharti undertook a thorough investigation of the Narmada valley. To confirm the authenticity of Kharti's observations Supekar carried out a small excavation in the middle basin. Near Maheshwar, Armond tried to locate the primary localities of palaeolithic man. While the above mentioned scholars were busy in establishing the river deposit sequence, Joshi chose a small rock-shelter for excavation in the adjoining region of Hoshangabad, previously reported by De Terra and Paterson (1939).

Regarding the Pleistocene stratigraphy of the basin, different observations and views have been expressed from time to time. They are being briefly stated below. According to De Terra, the ancient alluvium which has filled the 'deep rock basin' shows three different sedimentary phases *i.e.*, silt, sand and gravel. They are named 'Black cotton soil', 'Upper group' and 'Lower group', respectively. "The Lower group contains the Middle Pleistocene fauna......and most of the early palaeolithic tools" (De Terra and Paterson, 1939 : 313-326). The artefacts of this stratum are characterised by typical 'Abbevilleo-Acheulean' handaxes with a few 'Early Soan' type tools. The upper group yielded a developed handaxe industry with some Late Soan elements (De Terra and Paterson, 1939). McCown and Banerjee re-examined the sections in the year 1958 and observed that "Nowhere do we get a clear stratigraphical picture as postulated by De Terra" (Sankalia, 1962 : 52).

The Pleistocene deposits around Maheshwar and Mandaleshwar according to Subbarao and Sankalia correspond with that of Yale Cambridge expedition experts (Sankalia *et. al.*, 1958 : 20). Khatri observed some what different stratigraphy, near Mahadeo-Piparia. The 'red clay', the lower-most layer in this section is sticky and 8-9′ thick. It is devoid of human activity and fauna remains. Overlying it is the first 'cemented gravel' which has yielded pebble-tools along with fossilized *Elphas* remains. The covering deposit here consisted of red clay which has been eroded at places and replaced by cemented sandy gravel (II), yielding 'Series I' or Early Middle Acheulean tools. This group of implements seems to be associated with semi-mineralized fossils. The fifth layer of 25-30′ thickness is composed of sandy yellow deposit and has revealed reminiscent of fauna along with 'Series II' tools. This is overlain by a brownish clay layer which consists of a single semi-fossilized shoulder blade. The seventh layer, the microlith-yielding 'Black cotton soil', finally seals the whole section (Khatri, 1963 : 186-88).

The said stratigraphy, showing a gradual techno-typological evolution of the industries seems to be quite tautolizing but scholars have doubted its authenticity. According to Khatri the pebble-tool complex or Mahadevian is a 'Pre-Chellian' industry and can be equated with the assemblage coming from the 'lower level of bed II of Olduvia Gorge in East Africa' (Khatri, 1963).

The later survey by the archaeologist of Deccan College has ruled out Khatri's presumptions (*IAR*, 1962-63 : 11). Supekar of the same institute worked in the region for two subsequent years (1968). According to him, it is difficult to distinguish the Lower Palaeolithic horizon from that of the Middle Palaeolithic, at Mahadeo-Piparia. Hence the possibility of recognition of various cultural evolutionary stages within the Lower Palaeolithic phase is completely ruled out. Supekar's observation is further supported by that of Armond's, who worked at Durkadi-nala, near Maheshwar.

The numerous Lower Palaeolithic-yielding localities of this area, on general typological considerations can be grouped under (a) industries dominated by 'Pebble-tools' and (b) those dominated by handaxe-cleaver group. MAHADEO-PIPARIA represents the former group and the latter group is represented by ADAMGARH shelter finds. Both the Lower Palaeolithic and Middle Palaeolithic industries from these have been selected for detailed techno-typological analysis in the course of the present study.

Raisen district of Madhya Pradesh, has recently been shown to be very promising with regard to the palaeolithic settlements. It is drained by two major river systems. The Jamuna (with it's tributary Betwa) and Narmada (with it's small tributaries). The potentiality of the region was brought to light in the year 1958, by V. S. Wakankar (*IAR* 1958-59). Thereafter the subsequent investigation in the area by him and recent work by Misra and Jacobson have revealed a group of rock-shelters containing paintings and habitational deposits and openair factory-sites.

An intensive systematic work is being conducted in the district by Jacobson since 1973. The Anthrological approach of Jacobson in this case was aimed, 'to determine the nature of the cultural adaptations and their place in the ecological systems of the period of Early Stone Age occupation" (Jacobson, 1970). The area of his research lies about forty mile east of Bhopal and 11 miles east of the district town Raisen. His research mainly bases on the systematic examination of surface finds of Early Stone Age remains. It is learned that huge collections have been made. The artefacts have been classified and their techno-typological details noted. But as the investigator seems to be more interested in the nature of settlements, the details of the human activities is yet to come.

The district is now well known to the Indian archaeologists, for the discovery of BHIMBETKA. As mentioned above it was reported first by Wakankar, who has plotted over 600 shelters (Wakankar, 1973 : 23-32). "Of these nearly 475 contain paintings of Mesolithic and later date, and many (though a smaller number also bear habitation deposits of varying thickness and ranging in time from early Palaeolithic to late Mesolithic" (Misra, 1974). Lying about 45 km south of Bhopal it is located in the Vindhyan hills. The habitational deposits of ten shelters have been excavated so far. These excavations have brought to light the sequence from chopper-chopping stage to Late Mesolithic (Wakankar, 1973 and Misra, 1974). No distinct phase of Upper Palaeolithic, has yet been recognised here.

The excavations of Bhimbetka III F-24, 12, 16 and 33, by Wakankar has revealed the deposits of six periods *i.e.* (Ia) pebble-tool (Ib) Acheulian (II) Middle

Stone Age (III) Mesolithic implements with a few Upper Palaeolithic tools (IV) Chalcolithic (V) Early Historical (VI) Medieval and recent.

In the phase of evolved Acheulian remains of working floor has been recognised, which has been called an 'Auditorium' (Wakankar, 1973). The Acheulian and Middle Palaeolithic implements obtained, number 1943. Among these 994 are small flakes and 347 big-flakes. The total number of cores are thirty-three, and, the jasper or chalcedony lumps six. The finished tool-types in the Acheulian floor level I constitute-handaxe (32), cleavers (47), ovates (13), side-scraper (41) and hollow-scraper (21). In the next phase *i.e.* Acheulian floor level II, side-scrapers preponderate (41) and are followed by cleavers (26), hollow-scraper (10) and handaxes (5). The loss of handaxe-cleaver element in the Middle Palaeolithic level is compensated by the increased proportion of side-scraper (161), hollow-scraper (37) and the occurrence of borers (7).

The excavations at BHIM—III F-23, by Misra, however, do not confirm the stratigraphy claimed by Wakankar. The eight layers at shelter III F-23 have yielded typical Mousterian and Late Acheulian industries of Old Stone Age. The said cultures occupy the lower most layers *i.e.* 5 to 8. The three lowest layers have revealed Acheulian industries which have been studied by Misra in detail (Misra, 1974). The observations made by Misra, in this regard are :

The flake blades and chips form more than half of the assemblage (37 and 45%), cores are 4-8% of the group. A considerable number of discoidal cores were also noticed.

Levallois flakes have been included within the finished tool group. They form 11 to 15%. Frequency of non-Levallois blades is 5-11%. Various types of scrapers made on flakes dominate the finished tool group, cleavers are the next dominant type. Handaxes occur in limited number and are not well made in comparison to the cleavers. Knives fair well. The proportion of end-scrapers and denticulated implements form 2 to 7%. In contrast to Wakankar, Misra has drawn attention towards the negative evidence for the presence of chopper-chopping tools in the material (Misra, 1974).

The work in this region (both at the open-air-factory sites and habitational sites) is still in progress.

NORTHERN FRINGES OF THE PENINSULA

The area under discussion is a narrow strip of land, lying in between the Narmada-basin and the Indo-Gangetic plains. Its boundary in the south is formed by the ranges of Maikal and in the north-west and north-east it is bounded by the rivers Indus and Ganges, respectively. This triangular land-mass with a composite physiographic characteristics separates the Soan group of the extreme north from the handaxe-cleaver dominated industries of the Deccan.

The base of this land falls within the Godwana system. This geological formation is characterised by thick depositions of sand-stone, shale and clay (Spate, 1954). The importance of the Aravallis and the Vindhyan ranges lies in the highland formed by them, which is the source of almost all the important rivers of the region *i.e.* the Chambla, the Betwa, the Ken and the Soan.

The Pleistocene discoveries of the region will be discussed under the following four heads *viz.*, Chambel-basin, Betwa-basin, Belan-basin, Upper Son-basin.

Chambal-basin

The river Chambal is an important tributary of the river Yamuna. It drains the western part of Madhya Pradesh and south-eastern Rajasthan. The Chambal system waters two phisiographic units *viz.*, the Malwa plateau and Rajputana which have been intensively investigated by Khatri and Misra respectively.

The Malwa plateau is served by the lower course of the river Chambal and it's tributary Sivna. The latter originates from a place near Pratapgarh (in Rajasthan) and drains into the Gandhi-Sagar Dam in the Mandsor district. The basin of the river Sivna has yielded a number of palaeolithic localities. The noteworthy among these are—Bhangarh, Nanakanthur, Chikalia, Nabharagarh, Khadki and Mandsor (Khatri, 1957). The Lower and Middle Palaeolithic assemblages of this region either come from or have been associated with the 'lower' and 'upper' gravels, respectively.

The largest collection of the Lower Palaeolithic implements come from MANDSOR and that of the Middle Palaeolithic form MANDSOR KHADKI and NALGARH. The tools belonging to the Lower Palaeolithic phase from the sites, were though made available to us for first hand study it was not possible to include them for detailed analysis. Besides none of the Middle Palaeolithic localities mentioned above have yielded a good amount of tools. We have, therefore, to be content with a more mention of the observations made by Khatri, on their typo-technological features.

The artefacts of the Middle Palaeolithic phase are three-hundred and twenty-one. They are made on jasper nodules. Besides the dominant trend represented by side-scrapers and points, end-scrapers also fair well. The group of sixty-three flakes constitutes twenty-five 'blade like flakes' and forty-eight 'other chips'. Khatri is of the opinion that Clactonian technique dominates the industry. The...... "flakes have simple platforms with obtuse striking angles and hence detached by Clactonian technique and no Levallois influence is observed so far" (Khatri, 1958 : 164-65). 'Irregular flake cores' number nine and there are seventeen 'fulted cores' with an absence of true blades.

Rajputana

Rajputana is served by quite a few rivers like the Luni and Chambal (along with their tributaries) are known to have yielded Pleistocene remains. The area was surveyed by Misra from time to time. The Pleistocene-implementiferous deposits are generally similar to those of the other areas of the Peninsula. The Gravel I yielded the Early Stone Age tools and the Gravel II of the Middle Stone Age.

The Luni in it's upper course runs through a part of western Rajputana. The exposed Middle Pleistocene deposits here contain Middle Palaeolithic tools. Misra could notice eight sites *viz.*, Sanḍari, Dundara, Luni, Srikrishnapura, Golia, Hundgaon, Bhawi and Pichak.

The other rivers reporters to have yielded palaeoliths are Banas and it's tributaries Berach-Wagan and Gambhiri-Kadamla.

The Pleistocene deposits of the area as observed by Misra are as follows :

Three layers of 'Mottled clay', boulder conglomerate and silt occurring in the succession from bottom have been noted. Only the middle layer of 'boulder-conglomerate' is implementiferous. It is known to have revealed Lower Palaeolithic implements. The artefacts of the next phase *i.e.*, Middle Palaeolithic, come from the second gravel, which overlies the silt deposit (Misra, 1967).

The discoveries from Berach-Wagan basin are sporadic in nature. Nine different localities could yield only one hundred and sixty-one tools of Lower Palaeolithic phase. The localities are situated on the banks of Berach. The position is not better in the basin of wagan where a limited number of tools (108) were obtained. The typology of these collections place them within Acheulian tradition, marked by the presence of handaxe-cleaver group. A part of the finished tool group consists of chopper-chopping elements and thick scrapers made of flakes. The small group of cores, according to the investigator.... "do not conform to any well defined type. Two, three or more flakes have been removed from each piece, using a naturally flat area or a previous flake-scar as striking platform, and leaving deep negative bulbs" (Misra, 1967 : 23). Besides the reworked specimens the three-fold grouping of the flakes is—plain flakes, Levallois flakes and blades.

The group of two hundred and seventeen artefacts of the Middle Palaeolithic tradition has been recovered mainly from the localities Bhutia, Hajrakheri, Beawar and Champakheri. This group of tools are made on chert, jasper quartzite and sandstone (Misra, 1967 : 73 ff). The sixty-six finished tools form fifty percent of the, collection and consists of the following types:— handaxe (7), borer (1), point (5), core-scraper (13) and flake-scraper (40) (Cf. Misra, 1967). The investigator has mentioned two Tortoise cores, ten discoidal cores and also a good number of Levallois flakes (twenty-two out of the total number of one hundred and twenty-seven flakes).

The important Lower Palaeolithic locality of Gambhiri-Kadmal I basin is CHITORGARH.

The total number of Middle Palaeolithic artefacts from the region are very limited *i.e.* sixty-five. This small assemblage was obtained from the basin of KADMALI (Misra, 1967). The implements of this group are made out of quartzite pebbles. The prominent feature of the assemblage is the prepondering position of scrapers. The types such as end-scraper, core-scraper and miniature handaxe enjoy an equal proportion, which is quite limited (three each). The presence of borer is represented by a single specimen. Out of the five cores according to the investigator four belongs to the groups of 'Discoidal' and one to 'Blade' core types. The types noticed within flakes are—plain flakes (33), Levallois flake (9), and blade (2).

Betwa-basin or Bundelkhand

The Betwa is an important tributary of the river Yamuna. The part of Bundelkhand (23°9′ and 25°51′N and 78°10′ and 79°25′ E), which is served by the upper course of the river Betwa and it's tributary streams was surveyed by Rameshwar Singh (*IAR*, 1955-56 : 68; 1956-57: 5, 8, 11). The lower course of Betwa draining the districts of Hamirpur and Jhansi was investigated by a team of the Banaras Hindu University, under the leadership of P. C. Pant (1965 : 8). It is noteworthy that the two investigations, have brought out two different lithic traditions within the Lower Palaeolithic phase of the region.

Rameshwar Singh could discover an Open air factory-site of Acheulian tradition. The implements from LALITPUR, were studied by us in the Deccan

College, Poona. Hence, it has been incorporated within the scope of the Chapter III.

A cluster of Middle Palaeolithic localities were noticed on the river Dhasan (a tributary of Betwa). They are Sihara, Ghatsemtra, Hasrai and Gondhi. Not a single assemblage from the said localities, was found suitable for the present study. However, the SIHORA locality, which is situated on Dhasan, has revealed a good amount of tools *i.e.* three hundred and twenty-one (Singh, 1965). According to Singh, the assemblage consists of nineteen handaxes ; one cleaver ; sixty-three scrapers of various types ; eight points ; eight awls ; twelve core and a number of flakes. The flakes have been classified into primary, semi-primary and secondary flakes. Faceted core technique and indirect percussion and punch techniques for detaching flakes and blades seem to be in frequent practice.

The other locality which needs a special treatment, is situated on the river Betwa. This locality, GONCHI (78°10′ and 24°22′), has yielded two-hundred and two specimens. Except twenty-eight tools, which have been obtained *in situ*, the rest come from the surface. This particular tool-kit is charaterised by the dominance of side-scrapers, along with the presence of point, awls, handaxes and cleavers in low proportion. The group of twenty-three cores has been classified into polyhedral, chopper-like, chopping-tool type, discoidal, conical, elongated, round and faceted flake-blade and blade cores (Singh, 1965). Singh's collection includes eight different types of flakes *i.e.* triangular flake, flake-blade, blade, blunted-blade, faceted flake, primary flake, semi-primary flake and waste-flake. Semi-primary flakes seem to dominate and waste-flakes occupy the second position (34 and 38 respectively). Though flake-blades are eleven, yet there is only one blade. Perhaps two specimens of this assemblage can be grouped as Levallois points.

The association of the implements of earlier tradition within the Middle Palaeolithic tool-kit, demarkates this region from the other parts of the Peninsula. In most of the cases the Middle Palaeothic industries are devoid of handaxe and cleaver of the earlier tradition *i.e.* Lower Palaeolithic culture.

The tri-junction of Hamirpur, Jhansi and Chhatarpur districts of Uttar Pradesh and Madhya Pradesh has revealed noteworthy remains of pebble-tool complex. P. C. Pant noticed an implementiferous deposit of Pleistocene epoch, near the village LAHCHURA (Lat. 29°10′ N and Long. 79°18′ E), on the river Dhasan, (Pant, 1965 : 8). At this place,... "A cemented gravel, from one to one and half feet in thickness, directly lies over the heavily eroded and weathered granite bed-rock on the western bank of the river. This gravel deposit is covered by a thick layer of coarse sandy alluvium" (Pant, 1965 : 8). The occurrence of two other gravels, intervened by alluvium deposits, at a few localities, is re-deposition of the *in situ* gravel. Two implements, one chopper and one flake, were obtained *in situ* and two flakes come from the re-deposited layers of the gravel. The total number of artefacts reported from this locality is one hundred and thirty-three.

Though most of the components of this assemblage are fashioned out of quartzite pebbles, a few are also made on granite, opal, jasper and quartz pebbles. The occupation of the major part of this assemblage (82%), by chopper-chopping implements, conforms with the Soanian tradition of Extra-Peninsula. The choppers form sixty-eight percent and the chopping-tools fourteen percent. The twenty-one flakes are recorded as 'waste-chips' by the investigator. There are nine implements made on flakes. The technique used for detaching flakes in this is 'block-on-block'. The absence of the true 'Abbevilleo-Acheulian' element in this regard has been interpreted as, ... "a full blooded Early Soan industry" (Pant, 1965 : 9). It may be suggested that such assemblages which reveal new typo-technological trend in a particular region, should be distinguished by assigning local names.

Ken-basin

The potentiality of the region can be more truthfully discussed by making two-fold divisions of the geological and cultural regions, *viz.*, Damoh area and Banda district. The Damoh area, lying in Madhya Pradesh is traversed by the Sonar and the Kopra rivers, both being small tributaries of the river Ken. In the district of Banda (Uttar Pradesh) palaeolithic localities were noticed on the banks of the river Ken. It is intended to examine both in the aforesaid order.

The intensive survey conducted by Joshi, in the area of DAMOH and Sagar (LONG. 784°5′ & 79°39′ E and Lat. 24°20′ and 23°15′ N), has revealed the following stratigraphy.

The sandstone or shale bed-rock is overlain by the implementiferous Gravel I, which at some places has been covered by silt. Atleast at one place *i.e.*, Rehli, the second grvel directly rests on the Gravel I. The silt deposit, finally seals the whole section (Joshi, 1961 : 11). In the collection of ninety-one implements of Lower Palaeolithic phase, twenty-four were obtained from the lower gravel. The remaining were collected from the surface of six localities *i.e.* Rehli, Ghogra, Harat, Aslana, Mariado and Narsinghgarh, Tardelhi and Gaisabad (Joshi, 1961 : 12). All these discoveries can be grouped as stray finds, as none of them has yielded more than thirty-four implements. The techno-typological features of these assemblages indicate the existence of implements belonging to Acheulian tradition in good proportion along with chopper-chopping element. Flakes, in general were detached from the cores, which were devoid of preparation marks, (Joshi, 1961 : 19).

The tool-kit of Series II, is made on chert and chalcedony, and contains two-hundred and twenty-four specimens. These were obtained from the Gravel II and/or the surface of the four different localities, *viz.*, Khajakeri,, Basa, Rehli, Piparia-Maria (Joshi, 1961 : 20). The typical implements of these assemblages are, scraper, point and borer. Flakes preponderate and are associated with a small proportion of blades, flake-blades, cores and nodules, majority of which according to the investigator is that having obtuse angled plain striking platform and unworked upper surface. "Those with cortex fronts are evidently waste-flakes removed from the pebbles in their initial dressing before the flakes were taken out for tools. But in fairly large number of flakes the upper surface carries either roughly longitudinal or converging scars, indicative of their removal from partially or fully prepared cores" (Joshi, 1961 : 24).

In the Panna district of Madhya Pradesh, Joshi and Soundara Rajan noticed terraces formed by the river Ken (*IAR*, 1957-58 : 26). The upper terrace has been associated with the tools made in 'Madras facies' and also with pebble-tools. The occurrence of pebble-tools with handaxes, according to the investigators... "had no specific typological relationship with the Early Soan, instead the stages of fabrication represented by them revealed their own story of gradual typological evolution from the unspecialized core to the bifacial handaxe" (*IAR*, 1957-58 : 26). As the collection was available for examination to us, it was thus possible to enumerate the typo-technological details of the assemblage (cf. Chapter III).

A few 'Series II' implements were also picked up from the lower terrace at BARIARPUR and Kohari. The latter is not of much significance.

The district of Banda (Uttar Pradesh) was surveyed by the teams of Allahabad and Banaras Hindu Universities, under the leadership of G. R. Sharma and P. C. Pant, respectively. Sharma, noticed three terraces on the river Ken near the village Bariari. The terrace 1 of the river Ken, at this place is reported to have yielded 'bifacial industry of the Madras complex in association with Clactonain flakes'. The second terrace contains washed-down Lower Palaeolithic, and also Middle and Upper Palaeolithic tools. The Microlithic industry of the area comes from the surface of the youngest terrace (*IAR*, 1955-56 : 4).

The discoveries by the second team are in the form of three type of localities. The first group consists of the sites situated on the banks of the river Ken, Baghain and Paisuni. The loose gravel lying in the river beds has yielded tools of the earliest phase. The only other cliff deposit of 60′-65′ thick alluvium is sterile. The localities of the Lower Palaeolithic phase are Ramchandra hill, Durendi, Sitapur and Lodhawara. The small assemblages from these four localities comprise han-

handaxes, choppers, cleavers and flakes detached by 'block-on-block' technique (Pant, 1963-64 : 114-142.

The remaining two group of sites were noticed on the hill tops or in the vicinity of hills. The implements obtained from these belong to Middle and Late Stone Age cultures. The localities which have yielded Middle Palaeolithic implements are BANKE-SIDHA, DURENDI, BARCCHA and BÀNKAT. The finds belong to scraper-point assemblage made on fine grained material which also have some advance tool-types like end-scrapers, and burins. 'Prepared core' or Levallois technique was also noticed at least in some cases (Pant, 1963-64 : 120-131).

Belan-basin

The river Belan originates from the Kaimur range in Rewa district of Madhya Pradesh and empties into the river Tons. The latter is a small tributary of the Ganges, and should not be confused with the other river of the same name, which is one of the major tributaries of the river Yamuna in the Himalayan region. The river Belan along with its tributary Seoti has revealed an important Pleistocene sequence in the districts of Allahabad and Mirzapur of Uttar Pradesh. The credit for discovering the potentialities of this region goes to G. R. Sharma and his colleagues. As a result of intensive investigations lasting several consecutive seasons the team confirmed the following stratigraphy :

The sandstone bed-rock is covered by a sterile layer. The formation of the latter is due to the decomposition of the bed-rock. The overlying boulder-conglomerate or Gravel I is cemented. This deposit of angular huge pebbles has yielded thirty-six Acheulean tools and a good number of faunal remains. The Gravel I is separated from the next implementiferous Gravel II by a sterile layer of brown silt (3.4 m thick). On account of cross bedding and intervening silt layers the Gravel II has been grouped within three phases, *i.e.* IIA, B and II C. This deposit is very rich with regard to both faunal and lithic remains. The lowermost phase is comparatively the coarsest of the three and has revealed both 'Early Stone Age' and 'Middle Stone Age' artefacts, thus, marking a transitional phase between the Acheulean and the Middle Palaeolithic traditions. The next phase belongs to 'Middle Stone Age' tradition, in which both quartzite and chert were used for manufacturing implements. The top most phase is composed of the finest gravel which consists of small tools made out of chert chunks. This group of tools has also been assigned to 'Middle Stone Age'. A similar industry was discovered from the 'red clay' or 'loose gravel', which rests over the highly cemented Gravel II. The next deposit of 'yellow clay' is associated with the assemblage belonging to a transitional phase between the Middle Palaeolithic and Upper Palaeolithic phases. The Gravel II, which forms the base for last silt layer, has yielded Upper Palaeolithic tools. The last formation again reveals a transitional phase of Upper Palaeolithic and 'non-geomatric Microlithic' traditions. Chronologically, it has been placed at the end of the Pleistocene epoch (Sharma, 1973 : 106-110).

We had an opportunity to examine the sections in the similar region. As a result of our own observations it is difficult to accept the validity of the three evolutionary stages within Gravel II suggested by Sharma. Moreover, the implements obtained *in situ* are much smaller in number to confirm or reject the picture postulated by Sharma.

The adjoining hillocks which are extension of the Kaimur range, have proved to be the treasure house of the activity of the palaeolithic man in the region. Projections of the hills with their gentle slopes merging with the plain, seem to be the ideal place for him to camp and manufacture implements. "Projecting portions of the hillocks or outcrops detached from the main hill, the erosional gullies at the weaker joints have generally been used as factory sites by Lower Palaeolithic man, possibly because such outcrops abunded in quartzite boulders" (Sharma, 1973 : 110). The similar sites of Middle Palaeolithic phase, are located at the foot of the hills. These are placed at the higher horizons than the Upper Palaeolithic factory sites. The shale bed-rock in these cases, are full of artefacts, both of finished tool group and waste or by-products. "So far 17 factory sites of the Lower Palaeolithic, 23 of the Middle Palaeolithic and about half-a dozen of Upper Palaeolithic have been discovered" (Sharma, 1973 : 108-110). Their concentration is on the hillocks of Chandatari, Ramgarh, Kobra and Drummondganj (*IAR*, 19).

Our detailed analysis dealing with techno-typological features, is based on the two collections. They come from CHHATARPALIA and RAMGARHWA and represent Lower and Middle Palaeolithic phases of the region, respectively. A detailed paper dealing with the cultural and environmental conditions of Upper Palaeolithic phase of the region was presented by R. K. Verma in the Seminar on Indian Prehistory, 1974, held at Poona. Comments on all the three phases of the region has been dealt in the respective chapters of the present book.

Son-basin

The river Son flows from Son-mund in the high-lands of the Amarkantak hills and in its northern and eastern flow drains the states of Madhya Pradesh, Uttar Pradesh and Bihar (Misra, 1970 : 65-66). Its important tributaries are Johilla, Banas and Gopat. The upper and middle course of the river Son has revealed the remains of palaeolithic man. The finds from the region will be discussed under two heads *viz.*, Upper Son basin and Singrauli basin.

Upper Son

The area of Upper Son, includes the districts of Jabalpur, (a part of Katani sub-division), Shahdol, Sidhi, and Bilaspur of Madhya Pradesh. The first palaeolith from this region was reported by Oldham (Ref. to Foote, 1961). Since then quite a few scholars have visited the area *viz*, Wakankar (*IAR*, 1956-57 : 79), Joshi (*IAR*, 1957-58 : 25-26), Sengupta (*IAR*, 1961-62 : 8-9) and Nisar Ahmed.

The Pleistocene deposits here, according to Ahmed are similar to those of the other parts of the Peninsula. That is from bottom to top, the section is composed of boulder-conglomerate yielding 'Early Stone Age' tool; a sterile layer of dark brown sandy silt; sandy gravel containing 'Middle Stone Age' artefacts; sterile yellow brown silt; and, a black-brown soil yielding a 'Late Stone Age' assemblage (Ahmed, 1966 : 3-7).

As many as sixty-five Stone Age localities have been brought to light by Ahmed in the Upper reaches of Son. The Series III of the region which has been thought to belong to the 'Late Stone Age' tradition seems to be a reminiscent of Blade-burin Poona industry. This is based on the examination of the material by the author in the Deccan College, Poona. None of the localities of this region has revealed a sufficient number of implements which could be utilised for the present study. Hence, the collections could not be subjected to the detailed comparative analysis.

In accordance with the usual practise, the assemblages of Lower Palaeolithic phase on typological and technological ground has been divided within three stages by the investigator (Ahmed, 1966 : 79-106). Though Ahmed does not call any flake as true Levallois, yet the drawings (Ahmed, 1966 Pls. XXXIII; Fig. 1, and XXXI, Figs. 1 and 2) leave no doubt that a good deal of Levallois element is present in the area. Besides, their is also a classical Tortoise core (Ahmed, 1966, Pl. XL, Fig. 2) which has been wrongly listed as a disc-shaped side-scraper on core. To conclude, the assemblage belongs to the typical Acheulean phase with a considerably good number of pebble-tools and advance flake-detaching techniques.

The total number of Middle Palaeolithic implements, reported from the region are one hundred and thirty-seven which come from a number of localities. Various types of side-scrapers, characterise the collection, along with the handaxe, one borer and a point. Blades with marginal retouch number seven. In the group of fifty-seven blanks, there were nine blades (15.8%), eight Levallois flakes (14.0%) and four Levallois points (7.0%). Similarly, at least six cores of Levallois fashion and three Mousterian cores were also noticed. The 'Series III' (*i.e.* Upper Palaeolithic) assemblages from the region have been taken up for detailed analysis.

Singrauli-Basin

The Singrauli-basin or the middle course of the Son river consisted of a group of Lower Palaeolithic sites which are now under water, after the constuction of Rihand reservoir. The area is drained by the rivers Son, Dudhi and Rihand. All are contributary streams to the river Son. On the grounds of geomorphology, the basin is separable within three groups, *viz.*, the northern or upper part, a composition of Gangetic alluvium; the middle part formed by Vindhyan sandstone and the lower or southern part, which is the bed of the river and belongs to the Cuddapah formation (Krishnaswami and Soundara Rajan, 1951 : 42). Besides the two terrace formations on the river Rihand, the schematic section on the rivers Rihand and Balia-Nadi is as follows :

The bed-rock of Talchir is covered by two gravels and silt deposits, which indicate the occurrence of two climatic cycles in the region (Krishnaswami and Soundara Rajan, 1951 : 42-43, 45).

The history of the investigations pertaining to palaeolithic finds in the region commences with the discovery made by Cockburn (1888). His work was followed by Oldham (Foote, 1961 : 161), De Terra and Paterson (1939 : 315) and Zuener (Ref. to Krishnaswami *et. al.*, 1951).

The only available account on these palaeoliths is in the form of a paper by Krishnaswami and Soundara Rajan (1951). These scholars record that, "The artefacts consists of a large series of Abbevillio-Acheulean bifacial handaxes, with a minor assemblage of pebble and core (chopping) tools forming 15 per cent of the collection. The biface tools include a well represented group of cleavers of many types. Apart from these, there are numerous flakes, both real tools and waste-flakes, amounting to 50 percent, of the entire collection. Of the good flakes there is a dominant 'proto-Levallois' group forming 18 percent. There is also 7 percent fo undoubted Levallois (faceted platform) flakes"... (Krishnaswami *et al.*, 1951 : 46). As we could not examine this collection, it is not possible to add anything further.

On the basis of the discovery of handaxe-cleaver group along with a limited number of pebble-tools Krishnaswami puts forward the possibility of the intermixture of the two cultural trends *i.e.*, the 'Madrasian' and the 'Soanian' at this particular place, a view no longer tenable in the face of the new evidence, discussed in Chapter III.

EASTERN INDIA

The area under discussion is the eastern most part of the Indian sub-continent and, comprises the states of Bihar, West Bengal, Orissa, Meghalaya, Assam, Mizoram, Nagaland and Arunachal. Physiography of this region is marked by plateaux; intermittent valleys and alluvium plains. The plateaux of Chotanagpur and Assam are of similar composition but are separated by Malda gap. The erosional activity of the rivers Ganges and Brahmaputra, is responsible for this division and also formation of extensive alluvium plains. The areas covered by this thick alluvium crust, rule-out the chances of revealing palaeolithic contents, as they are believed to have been formed in Holocene period. Such an area includes the North Bihar, almost whole of the West Bengal (leaving aside, a small part of Bankura district and Purulia district), coastal land of Orissa and the Mahanadi delta, North Assam and whole of the Bengla Desh. The concentration of implementiferous localities, in the plateau and their extensions, are considered under the following three sub-region *viz*., Chotanagpur plateau, (including South Bihar and West Bengal), Orissa and Assam.

Chotanagpur Plateau

Situated at north-eastern projection of the Indian Peninsula, Chotanagpur is one of the major components of the Eastern plateau, its extreme points lie between 22°0—25°30′ N Lat. and 38°47′—87°50′ E Long., comprising the districts of Ranchi, Hazaribagh, Singhbhum, Dhanbad, Palamau and Santhal Paragana of Bihar and Purulia district of West Bengal. Chotanagpur was formed in Archaean of Vedic era. "Thus the geological foundation of the area is a series of batholyths intruded into the ancient sedimentary strata known as Dharwars" (Singh, 1969 : 5). The area inclusive with in the boundaries of Bihar state will be discussed, here, for the West Bengal is being discussed separately.

Most of the palaeoliths reported from time to time are stray finds and except in case of Singhbhum no area has been throughly investigated in a manner that could reveal palaeolithic settlements. Palaeoliths have been found from Rajrappa in Hazaribagh (*IAR*, 1959-60 : 12-14; 1960-61 : 58), Marvania Pratappur in Palamau (*IAR*, 1959-60 : 12-14). Paharpur in Santhal Paragana (*IAR*, 1960-61: 5), Lota Pahar and Barda Bridge in Singhbhum (*IAR* 1959-60 : 12-14), Namkum, Sabia Tantisilwali in Ranchi (*IAR*, 1964-65 : 5) etc.

Lying in the southern most part of Chotanagpur, SINGHBHUM district is situated between Lat. 21°58′—23°36′ N and Long. 88°0′—86°54′ E. After the initial discovery of chert flakes, near Chaibasa, in the year 1868, by Captain Beeching (Ref. to Ghosh, 1970 : 4), the first intensive survey was done by Asok K. Ghosh of department of Anthropology, University of Calcutta (Ghosh, 1970).

The Pleistocene deposits are confined to the present river valleys of the region. The important among them are Subernrekha, Koel etc. The laterite deposited some time in the early phase of Pleistocene, is covered by the 'Mottled clay'. The junction of Mottled clay with the overlying Conglomerate has revealed Abbevillian assemblages. "Man apperently lived on the surface of Mottled clay, after deposition was more or less complete" (Ghosh, 1970 : 6). In schematic section the next layer is that of lower gravel conglomerate which has yielded implements of Acheulean I type. The next lithic trend Acheulean II was obtained from the 'Lower clay'. The superimposed loose gravel, contains Acheulean III industry. Its interface with overlying Upper clay has yielded the implements belonging to the Singhbhum 'Flake-blade industry' (Ghosh, 1970 : 8).

The palaeolithic finds of the region has been divided within five groups by the investigator *viz*., Chandil, Sini, Ghatsila, Chaibasa and Jumda (Gua). As it was not possible to study the collection it is proposed to mention the typo-technological features of the lithic industries as done by Ghosh and after a few comments of our own.

The lithic group of Lower Palaeolithic phase has been discussed under 'Chopper-Biface industry' by the investigator (for the discussion of the use of the term see pp. 10f.). It has been divided within the four techno-typological evolutionary stages, basing on stratigraphy. They are Abbevillian, Acheulean I, II and III. Jamda (Gua), is devoid of this phase. The total number of Abbevillian and Acheulean implements from Chaibasa are thirty-two and Sini only nineteen. Only Chandil and Ghatsila have revealed two hundred and twenty-seven and two hundred and seventeen implements. It should be taken note of that the total number of implements from the two said regions were obtained from nineteen localities of Chandil and nine localities of Ghatsila. It is rather surprising that the investigator has attempted to work out an evolutionary trend on this group of stray finds.

The 'Flake industry' of Singhbhum comprises a total number of three-hundred and twenty specimens. Their area-wise distribution is as follows: Chaibasa-3, Sini-18, Gua-35, Ghatsila-85 and Chandil-179. Eight localities of Ghatsila and sixteen localities of Chandil, have participated in the said collection.

Scrapers are the most dominant type (75.50%). Handaxe-cleaver tradition is also represented by a limited number of implements. Judging the name given to this group, one would expect the dominance of flake which suprisingly enough does not find any clear mention in Ghosh's account.

The components of the 'Flake-blade industry' are only two hundred and ten. Chaibasa is sterile in this respect. The number of implements in the remaining regions are—Gua-31, Ghatsila-48, Sini-55 and Chandil-76. It is interesting to note that the characteristic feature of this industry *i.e.*, blades form only 9 percent of the total collection. One is ignorant about the percentage of flakes in this case also. Scrapers still dominate the industry, but their sub-types are unknown. Burins are almost negligible.

To us the discoveries of Ghosh are of sporadic nature, and need not be taken as industries. They are group of small assemblages, coming from a number of localities. Thus it was felt that the statistical calculations done in this, does not carry much weight and the same holds good for Ghosh's observations regarding the evolutionary stages.

The adjoining regions of Chotanagpur, have revealed the palaeolithic remains. They are situated in the Jethian valley and Kharagpur range, which are extensions of Chotanagpur plateau.

The valley of JETHIAN, situated in the northern part of the Gaya district, Bihar, is well known for the Buddhist remains of Rajgir. The hill, an outcrop of Chotanagpur plateau, stands in the thick alluvial deposit of the Gangetic plain. *Jamunia nala*, a tributary stream of the river Ganges has exposed three and a half meters thick Pleistocene deposit. The 'rubble-gravel' which lies at the base has yielded 'Early Stone Age' artefacts. This implementiferous layer is covered by 'brown-red' and sub-recent silt deposits, respectively (Narain, 1969). The existence of the Middle and Upper Palaeolithic phases in the area is unknown.

The Lower Palaeolithic artefacts of the area are made of quartzite, which is easily available in the area. Total number of implements picked up from this area is twenty-one. The assemblage comprises six handaxes, three cleavers, one chopper, one chopping-tool, six flakes and three cores. The last named are both prepared and unprepared. Narain has suggested the existence of three technological stages. The first of them is characterised by the use 'block-on-block' technique. The introduction of 'cylinder hammer technique' marks the second stage and the third stage evidences the beginning of Levallois technique. The assemblage is a reminiscent of Acheulean industry, and contains both flakes of unprepared and

Levallois types. It was hard to recognize distinctly all the three said technological stages.

The palaeolithic finds from the Kharagpur range are confined to the Monghyr district of Bihar. Being a part of Chotanagpur plateau, it is composed of Bengal Gneiss, Dharwar and Schists of Archaean system. At the northern side this hill range is comparatively high. It gradually dips into the thick Gangetic alluvium towards the north. Palaeolith-yielding localities have been reported from two parts of this hill. (i) Around the forested region known as Bhimbandh and (ii) on a isolated hill top near Jamalpur.

Situated about thirty mile south-east of Monghyr (dist. head quarters of Monghyr), BHIMBANDH is famous for its hot springs. Previous to our visit in the year 1972, Lower Palaeolithic implements were reported from the site (Singh, 1958, *IAR*, 1960-61 : 5-6; 1965-66 : 7-8). The team from Banaras Hindu University, of which the present author was a member, surveyed the area around Bhimbandh, under the guidance of P. C. Pant. A number of surface collections were made by us. An industry comprising finely made Acheulean implements *i.e.*, handaxes and cleavers and a good amount of Levallois flakes were obtained from the area around Paisara forest rest house (Pant, Jayaswal and Tiwari, 1976). Near the hot spring, at Bhimbandh a rich Middle Palaeolithic open air factory-site was noticed. A few furlong away from it, artefacts made on grey chert were found. These comprised blades and flakes. Some palaeoliths have also been reported from the Kharagpur (on the banks of the river Man), by Bose *et al.* (1960).

The town of JAMALPUR on the Patna-Howrah railway is mainly known for the mechanical department of the eastern Railway. The palaeolithic site is situated on a flat top of a small hill, locally known as Kalipahar, about one km to the east of Jamalpur railway station. Palaeoliths were reported by Singh from the place (Singh, 1958; *IAR*, 1960-61 : 5-6). We made a fair collection of quartzite implements during two hurried visits at the site in the years 1968 and 1972. On techno-typological grounds this collection seems to form a part of a Middle Palaeolithic industry. Even a cursory examination of the tool kit will convince anybody about its unique traits. To us, this industry marks a regional variation within the techno-typological trends of the Middle Palaeolithic phase of the Peninsula.

The group of side scrapers prepondering the assemblage are made on flakes. In this type denticulated specimens fair well. All the other types such as single-side, double-side, hollow, angle-scraper are present. The other characteristic feature in this is the very high frequency of end-scrapers. It was noted that flakes having a small beaked projection or projections, were invariably retouched at high angle.

The overwhelming preference within the end-scrapers, is given to the pointed-beaked edges rather than simple-convex edges. Point and broers are not many, but burins and knives fair well. A mention in this case is necessary for a special type of implement, which is so far unknown to us from Middle Palaeolithic phase of the sub-continent. We have named it Jamalpur Axe. One surface of this implement, in general has a middle ridge, formed by the intersection of two or more half negatives. The lower half of the other surface is invariably worked by detaching very small deep chips. A small group of handaxes, only two cleavers, three tranchets, two chisel-edged tools are also the additional features of the collection. Most of the flakes were obtained from Levallois technique. Massive prepared cores have also been noticed. Blades, and implements revealing tendency to notch indicate the technological advancement of the industry both with regard to the flake-detaching and retouching techniques. A similar tendency was also observed in the Middle Palaeolithic collection from Bhimbandh. If studied intensively, this region might reveal a regional variation within the Middle Palaeolithic phase of the sub-continent, which has been haunting the prehistorian since long.

The portion of West Bengal which is as extension of Chotanagpur plateau, has revealed palaeolithic remains. The implementiferous region lies in the districts of Midnapore, Bankura, Birbhum, Bardwan and Purulia. The first venture in this region was made by Krishnaswami. The explored basins of Kangsabati and Kumari in the districts of Bankura and Purulia have brought to light a number of palaeolithic localities of Series I and II (*IAR*, 1959-60 : 48-50). Subsequently, two teams belonging to the Directorate of Archaeology, West Bengal, and department of Anthropology, University of Calcutta worked in the region.

Under the leadership of P. C. Dasgupta, the first team discovered several 'Early Stone Age' and 'Middle Stone Age' sites in the region (*IAR*, 1962-63 : 43, 1963-64 : 59; 1964-65 : 51: 1965-66 : 55-57; 1968-69 : 41-42). The most important among these are the finds from Sisunia. The valley of the Gandhesvari river, in the Sisunia hills, was investigated in the years 1965-66 (*IAR*, 1965-66 : 55-57). This has..., "brought to light one of the largest factory sites of the Early Stone Age in Eastern India. Besides, fauna-assemblage of the Upper Pleistocene and earlier times was also obtained" (*IAR*, 1965-66 : 55).

The basal gravel, composed of quartz and quartzite pebbles with sticky clay, has revealed 'Early Stone Age' tools. The tool kit, consists of evolved type of Acheulean tools such as pearshaped handaxes, ovates, cleavers etc. The said cemented gravel was overlain by a sandy deposit of yellowish to ochre-red colour. This has revealed 'Middle Stone Age' implements and also fossilized or semi-fossilized faunal remains, assignable to Upper Pleistocene. The implements of 'Middle

Stone Age', include scrapers, points in association with a few implements made in Acheulean tradition. However, the members of the later group are smaller in size than the Acheulean implements of the earlier phase.

The team from the Anthropological department of the University of Calcutta, under the leadership of Ashok Kumar Ghosh, carried out investigations in the same region in the years 1963-64 to 1968-69 (*IAR*, 1963-64 : 62 ; 1964-65 : 48; 1965-66 : 58 and 1968-69 : 42). They discovered implements of various stages of Abbevillian, Acheulean traditions from Midnapore district (*IAR*, 1963-64 : 62; 1964-65 ; 48 and 1968-69 : 42). The artefacts of Acheulean tradition, were also observed in Purulia district (*IAR*, 1965-66 : 58). The detailed typological account of Ghosh's findings from West Bengal is available in the form of an unpublished dissertation (1966). The group of Acheulean tradition has been discussed under the 'Core-system' and the Middle Palaeolithic implements under the 'Flake system'. He has subdivided the latter group within 'early stage', which is characterised by the biface stage, but the dominance of flakes takes it under the 'Flake system'. The 'late stage' is represented by Levallois technique and fine retouching. The type-tools in this case consists of points and borers. 'Flake-blade' series, is also known from this region (Ghosh, 1966).

Orissa

The investigation relating to palaeolithic remains have been confined mostly to the northern most part of the state comprising the districts of Mayurbhanj, Keonjhar, Dhenkanal, Sundergarh and Sambalpur. The geological composition of the hills in this area is similar to that of the Chotanagpur plateau of South Bihar. The rivers Brahmani an important tributary of Mahanadi and Burhabalang, a small independent river, have exposed the following geological picture.

The base is formed by Archean and Godwana series, which are dated to Miocene period. The overlying Pleistocene and Holocene formations consists of laterite, gravel and alluvium deposits. The earliest tools are discovered from 'Pisolitic laterite' and 'boulder conglomerate' which were first dated to Middle Micocene (Bose and Sen, 1948 : 173). Subsequently, after a few corrections *i.e.* Lower Miocene and Lower Pleistocene (Bose and Sen, Ray, 1958 : 54), a much later date, Middle Pleistocene was assigned (Mohapatra, 1962 : 11-12).

The history of Stone Age finds of the region commences with Ball's discovery (Ref. to Banerjee, 1930). After a gap of nearly five decades, Acharya found a few neolithic implements from Baidpur and Khicking. Thereafter, R. D. Banerjee re-examined the two localities and pickedup a few palaeoliths

(Banerjee, 1930). The thorough investigation in the district of Mayurbhanj was undertaken in 1939 by a team from Anthropological department of Calcutta University under the leadership of N. K. Bose. The intensive exploratory work was followed by a series of excavations at various localities of Mayurbhanj (Bose and Sen, 1948). Later, four other districts of Orissa were surveyed by Mohapatra. They are Keonjhar, Dhenkanal, Sundergarh and Sambalpur (Mohapatra, 1962).

The excavations conducted by Bose and Sen at eight different localities in Mayurbhanj are Kuliana tank A and B, Kamata quarry C Kolobaria etc. They have revealed fifty-seven artefacts. Since they are typologically similar to six hundred and sixty-three surface finds, they have been grouped together. The Middle Palaeolithic phase was unrecognised at that time, hence not a single implement belonging to this phase was discussed.

The collection from Mayurbhanj is made on greyish quartzite, the main bulk constitutes of core tools (93.50%). Flakes are quite limited. Unprepared flakes and flakes with a little preparation seem to dominate the group. "A very small number of flakes, however, shows a Levalloisian manner of working" (Bose and Sen, 1948 : 127).

In general, the industry is said to be crude, but it contains three different techno-typological evolutionary stages. The first group of crudest implements comprises massive choppers. The group denoting the next stage consists of crude bifaces and also a few tools made on unprepared flakes. The third and final stage is represented by fine bifaces, crude cleavers and a few scrapers (Bose and Sen, 1948: 65-66). These three stages seem to be purely techno-typological and do not get any support from stratigraphy.

Mohapatra was lucky enough to discover both Lower and Middle Palaeolithic implements from the area of his investigation. The total number of artefacts discovered by him were one hundred and eighty-seven. Like Bose and Sen, he also classified his finds in three techno-typological evolutionary stages (Mohapatra, 1962 : 30).

Handaxes preponderate all the three stages. Pebble-tools though present are very limited in number. The flakes of all the three stages have been detached by 'block-on-block' technique implying thereby that they have unprepared wide angled striking platforms. 'Prepared platform' or Levallois flakes are said to be absent in all the three stages (Mohapatra, 1962). Mohapatra's observations are hardly convincing. Typology of the collection suggests its definite similarity with that of other industries of the Peninsula, which are of Acheulean tradition (also observed by Mohapatra, 1962 : 92). They all contain a good percentage of

Levallois element. Besides, Bose and Sen have also reported a few Levallois flakes in the Mayurbhanj collection. Furthermore some of Mohapatra's own drawings suggest the presence of Levallois technique in the region (Cf. Mohapatra, 1962).

The fine gravel or 'gravel II' overlying 'Early Stone Age' implementiferous layer has revealed Middle Stone Age tools. The total number of four hundred and four artefacts are made on several stones such as opal, chert, quartzite, fine grained quartz, jasper, shale and limestone. The collection contains 73.42% flakes, 13.12% cores and 13.36% nodules. The investigator tells us that the finished tools are dominated by scrapers (71.90%). They are followed by points (21.90%), scraper-borers (2.35%) and Borers and burins (1.90%) each. The core group is constituted by fifty-three specimens and is divisible within four sub-groups. They are discoidal (9.43%), speriodal (7.54%), fluted (9.43%) and irregular (73.58%). Tortoise cores seem to be absent and the possible reason for it, according to the investigator is..., "that they might have escaped the author's attention due to their scarcity" (Mohapatra, 1962 : 96).

The preponderating group of blanks, consists of six waste-chips, twenty-two blades or blade-like-flakes and the three types of flakes. 'End struck flakes are 91, Side struck 36 and the remaining are intermediate struck (Mohapatra, 1962). "The small percentage of prepared platform flakes and the absence of prepared cores may indicate a trait comparatively foreign to this culture of Orissa" (Mohapatra, 1962 : 96). The rarity of Levallois element in this area is due to the unsuitable nature of the available raw material by the prehistoric man.

Recently, Tripathy of Utkal University, Bhubaneshwar has explored the south-western part of Orissa, and has brought to light remains of old lithic tradition.

Assam

Assam, which previously included the present states of Nagaland, Meghalaya Arunachal, Mizoram, Manipur and Assam, has though proved to be a distinctive cultural zone of Neolithic period, drew a blank on the map of palaeolithic habitation. However, since 1960, a team of the department of Anthropology of Gauhati university, under the general guidence of Goswami and T. C. Sharma, has been conducting investigations in the area (*IAR*, 1967-68 : 7-8; 1968-69 : 2-3; 1969-70 : 1-2). The main area under investigation by this team is the Garo hills. A small exploration was also conducted in the selected parts of Arunachal (NEFA). The results of these surveys are proposed to be mentioned in the following paras:

Situated at the south-western corner of Assam, GARO hills is an extension of the Archean shield of the Peninsula. Such river-valleys, which contain outcrops of dolerite dykes, have revealed palaeolithic remains. In the absence of flint, quartzite and other siliceous stones, dolerite was extensively used for manufacturing implements of all the phases of Stone Age. A thick crust of reddish patina (sometimes upto 3 mm thick), characterises the tool kit of the region (Sharma, 1974). Palaeolithic implements have been reported from ten localities (Sharma, 1974).

The first implementiferous layer, 'cemented gravel', either rests on a sterile bluish clay or sandstone bed-rock. Implements of handaxe-cleaver and chopper-chopping traditions were obtained from it. The next layer of thick reddish-silt seems to be sterile. These deposits have been dated to the climatic cycles of Middle Pleistocene. At a locality, Waran, the yellow silt has yielded flake tools and a few belonging to Acheulean tradition. The assemblage is said to be characterised by Middle Palaeolithic trend, and has been dated to early part of the Late Pleistocene. The mention of Upper Palaeolithic assemblage is unrelated to a clear stratigraphical horizon. However, the investigators confess that due to the inadequate nature of evidence, it is not possible "to trace the evolution of the lithic industries of the Garo hills based on stratigraphy" (Sharma, 1974 : 5).

The list of the typological features of the discovered palaeoliths from the region is as follows :

In the Lower Palaeolithic group, choppers seem to form an integral part of the most dominant handaxe-cleaver tradition. Though the typological trend here conforms with the Handaxe-Cleaver industries of the Peninsula but with regard to the raw material, it only tallies with Nevasa-Chirki group.

The unique feature of the Series II or the Middle Palaeolithic assemblage, here, is the use of dolerite as raw material. The typological pattern, even then goes with the scraper-point tradition of the Indian Middle Palaeolithic. The well made scrapers and triangular points reveal Mousteriod character, whereas, a few Aterian points have also been obtained.

The Series III or Upper Palaeolithic phase of Garo hills, is characterised by big and small blades (13 and 5 cm), with rare occurrence of burins (only two). In the group of specialised tools 'leaf point' deserves a mention.

The exact proportion of the various tool-types, within the different phases of Old Stone Age lithic traditions, has yet to be worked out.

In the year 1969 and 1970, a joint expedition by the members of the Geological, Archaeological, Botanical and Zoological Surveys, of the Govt. of India, examined the DAPHABUM area of Lohit District. The three hundred kilometer land (lying between 27°45′ & 28°15′ N Lat. and 96° & 97° E Long.), falls within the boundary of North-East Frontier Agency. This was perhaps the first venture in the area. The aim of the investigation was,... "to correlate the Western Himalyan glacial and glacio-fluvial phenomena with the formation of terraces and Stone Age industries with that of the eastern region" (Bopardikar, 1972).

The formation of the hilly track, in the vicinity of the surveyed river valleys of Lathi, Telly (Lohit) and Kamlong, belongs to the Archean system (*IAR*, 169-70 : 30). The altitude of the surveyed area lies between 180 and 3350 m above MSL, and the tool bearing deposits are located between 914.4 and 1219.50 m.

A set of three terraces, was observed both on the Kamlong and Telly valleys. Ten sites bearing Paleistocene remains have been noticed. The total collection of palaeoliths contain twenty specimens. They are chopper, chopping-tool, proto-handaxe, ovates (2), cleavers (2), points on flake (2), side-scrapers on flake (5), flakes (4) and cores (2). The last named are of two types *i.e.*, discoidal and cylindrical. The implements are made on the locally available metamorphic rocks such as dolerite, gneisses and schists. The limited working on the artefacts is due to the utilization of cleavage planes by the prehistoric man. The selection for the desired size of lumps was facilitated by the fact that outcrops of gneisses and dykes are found in the neighbourhood (Bhoperdikar, 1972 : 1-8). Perhaps expeditions such as this one, is a welcome feature and could be fruitfully tried in other regions of the sub-continent, as well.

EXTRA PENINSULA

"The mountainous region of the Himalayas which borders India, to the west, north and east", is "known as Extra Peninsula" (Wadia, 1957 : 1). The Ganges, the Indus and the Brahmaputra are the main rivers which traverse the central, western and eastern parts of the region. But it is only the Indus valley along with its five major tributaries—Ravi, Chinab, Sutlej, Jhelum and Beas, which yielded palaeolithic remains. Besides, Soan is another small tributary of the Indus, the basin of which has been found to be rich in the palaeolithic remains.

The Himalayas, consisting of three parts known as Greater, Lesser and Outer Himalayas, have been formed between Middle Miocene and Lower Pleistocene periods (Wadia, 1957 : 35). The youngest or the Outer Himalayas are known as "Siwalik" formations, deriving its name from the mountain of the same name near Hardwar. This formation is the result of the accumulation of alluvium deposited by the various rivers and it has been divided into Lower, Middle and Upper Siwaliks (Wadia, 1957). The last named, represented by Tatrot and Pinjor Zones, is said to be a formation of Upper Pliocene and Lower Pleistocene periods. The *Karewas* of the Kashmir valley are the other formations which were deposited during a long period starting from Pliocene to Upper Pleistocene. The whole series 'consists of blue, grey and buff silts, and, partly compacted conglomerates and embedded moraines' (Wadia, 1957 : 385).

The moraines of the Himalayas noticed at different heights suggest the existence of at least four galciations of the Pleistocene period. Four such moraines can clearly be seen in Pirpanjal range between Baramula and Banihal pass (Wadia, 1957 : 385).

In the Potwar region the climatic fluctuations of the Pleistocene period have been noticed by De Terra and Paterson in the form of six terraces on the Indus and the Soan (De Terra and Paterson, 1939). Artefacts of various palaeolithic traditions have been found from all the six.

The palaeoliths from the region have been grouped by De Terra and Paterson into Pre-Soan, Early Soan and Late Soan. They seem to acquire both typo-techolo-gical and stratigraphical-cum-chronological order. A few of them have been further sub-divided within smaller units basing on the condition of the artefacts such as patination and rolling (De Terra and Paterson, 1939). Paterson along with Drummond later realised a few other trends in the region. The pebble-tool tradition is named as 'Soanian' which evolves from 'Lower Soan' to Final Soan, through Middle and Upper Soan cultures. The Pre-Soan is the earliest assemblage which does not consist of true Soan trends. Besides, the handaxe-cleaver complex has been named as 'Stellenbosch intrusion' and the development of flake tradition as 'Clactonian intrusion'. Both these traditions evolved in this region and are read in terms of foreign intrusion in the region (Paterson and Drummond, 1962).

The richest implementiferous localities situated on the rivers Soan and Indus are now in Pakistan and only one third material from the collection of 1935 expedi-tion is in India. This again is scattered in various museums. Although the author had an opportunity to study a few of these artefacts in the Government Museum, Madras; Indian Museum, Calcutta and the department of Anthropology, University of Calcutta, yet they form such a small proportion of the total collection that it is almost impossible to get a true picture of the assemblages. De Terra and Paterson's work (1939) deals primarily with the geology of the area, and the techno-typological details are unfortunately scanty. But the comparatively recent publication of Paterson and Drummond (1962), provides more detailed description about tool-types. Hence the cultural survey of the remains of the region is to be based on the second report. The following treatment, to these, is in the same choronological order which has been, assigned by the investigators (Paterson and Drummond, 1962).

Pre-Soan

The term 'Pre-Soan' is said to denote the stratigraphical position of the assemblage rather than its cultural relationship with the Soan industries. On the basis of stratigraphy, it is the earliest assemblage of the region, for it comes from the top of the 'boulder conglomerate' of terrace TD, which has been dated to the early phase of Middle Pleistocene or late phase of Lower Pleistocene (Paterson and Drummond, 1962 : 59). The localities yielding this assemblage are situated to the south-east of Rawalpindi in the Potwar region. They are—Malakpur, Adial, Chauntra, Kallar, Chaumukh and Jammu.

The total number of artefacts obtained from all these sites is only eight among which massive unprepared flakes dominate (six out of eight). The remaining two are pebble-tools of 'unilateral nuclear type' (Soan Type 6) which is comparable to pebble-scraper of our classification. The main features of the flakes are—unprepared dorsal surface, big and plain striking platform at an obtuse angle (100°—125°) to the ventral surface and no sign of reworking on the edges (Paterson and Drummond, 1962 : 59; Fig. 18a)

Though no core has been discovered yet, it is presumed that the asymmetric pebble cores might have been associated with the assemblage. Although the number of artefacts is too small to draw any valid conclusions, yet it does suggest that the authors of this industry were ignorant of any advanced technique for detaching blanks. The existence of 'Pre-Soan' as an industry has also at times been doubted (Oakley, 1964 : 10).

Lower Soan

The artefacts of this group come from the slope of the terrace TD, which has exposed the boulder conglomerate of the early part of Middle-Pleistocene (Paterson and Drummond, 1962). The total number of forty-eight artefacts consists of the following types—cores (12.5%), flakes (37.5%) and pebble-tools (50.0%). Soan type 4—'the convex edged oblates' and Soan type6—'unilateral nucleates' are the most dominating types in the last group. Then come Soan types 1, 4 and 3 in that order. There are only six cores consisting of 'proto-bifacial', 'asymmetric', 'pebble', 'spindle' and 'simple tortoise' types. Not a single flake of the industry corresponds with the last type of core. Most of the flakes are thick, with a high angle between the unprepared striking platform and the ventral surface, A few flakes also bear marks of partial preparation on dorsal surface. Retouching of flake, though rare, is conspicuous by its appearance for the first time. One flake has also been detached by 'bi-polar technique'. The ratio between the cores and flakes is 1 : 3. Bifacially-worked artefacts are comparatively rare.

The proportion of the flakes is smaller in this industry in comparison to the earlier one though as far as the flake detaching techniques are concerned this seems to be richer than the 'Pre-Soan' assemblage.

Middle Soan A

The industry under discussion comes from the top of the boulder conglomerate and also from the erosional slope of T 1, and has been dated to second phase of Middle Pleistocene (Paterson and Drummond, 1962 : 64). This assemblage consists of fifty-one artefacts, among which 'flake core' group predominates (40 out of 51). The remaining eleven consist of pebble-tools. In the latter group Soan type 6 is dominating over the types 1, 2, 3, 4 and 5. The core group consists of 'pebble' 'spindle' and in frequency is followed by 'proto-tortoise' types. The last type has been described in the following words, "The striking platforms of the flakes from such cores must have shown at the most three facets, and a platform angle of more than 90°, since the platform preparatory working is not at right angles as in truly faceted cores" (Paterson and Drummond, 1962 : 65). The evidence for more advanced techniques of detaching flakes has also been noticed by Paterson and Drummond, who held,... "a still more advanced type was used, with a tendency of longitudinal preparation..." (Paterson and Drummond, 1962 : 65). Three types of flakes have been discovered. They are flakes with thin unprepared striking platform at high angle to the flake surface, flakes with thick oblique platforms, which are either unfaceted or simply faceted and also a Levallois flake detached from longitudinal tortoise core. Nearly fifty percent of the flakes have been reworked in step flaking tradition.

The 'simple tortoise cores' of the 'Lower Soan' assemblage were further prepared and converted into the 'proto-tortoise cores'. This shows a gradual technological progress in the area.

Middle Stellenbosch

The industry has been named 'Middle Stellenbosch' because of typological affinity with the African biface culture. This assemblage is dominated by 'Handaxe-cleaver' group, with a complete absence of pebble-tools or Soan tool-types. This occurrence of a handful of biface assemblages among some pebble-tool industries has been termed as 'foreign invasion' by the scholars (Paterson and Drummond, 1962 : 95-101).

The assemblages come from Terrace 1, and stratigraphically lie between Middle Soan A and B. Only for this reason they have been dated to the later phase of the Middle Pleistocene. The sites of this lithic tradition in the Soan valley are Rawalpindi, Chauntra, Adial and Chakri and those on the Indus, Gariala, Chaksighu etc. In all one hundred artefacts were discovered from Chaksighu. Most of the implements are made in the Acheulean tradition and almost none in Soan tradition. All the core types which occur in the preceding industry are present in this as well, but three new types, *i.e.*, 'proto-tortoise', 'asymmetric' and 'biconical' cores, were introduced. Technologically this industry is more advanced than the preceding ones.

It would not be out of place to mention here the investigations of Paolo Groziosi, who brought to light a few those sites of this tradition in the vicinity of Chauntra and Chakri (Groziosi, 1964 : 1-58). The chief site of Groziosi is Morgh. He collected forty-four handaxes, seventeen cleavers and eleven pebble-tools, from the top of the high and low terraces. The implements have been dated to the second phase of Upper Pleistocene. This locality is important because of the fact that both the lithic traditions flourished here side by side. But the biface tradition seems to have had an upper hand.

Middle Soan B

Because the artefacts of this tradition come from the redeposited gravels of T1 and T2, they have been associated with the later phase of Middle Pleistocene or early part of Upper Pleistocene. The total number of artefacts is eighty-four, among which thirty-seven are pebble-tools, thirteen cores and seventeen flakes, the remaining seventeen being unclassified. Pebble tools are predominating in the assemblage. The most common type among them is Soan type 4 or 'convex oblate' though other types are also present (Paterson and Drummond, 1962 : 66).

The thirteen cores consist of the following types : 'pebble core', 'asymmetric core', 'proto-biconical core', 'spindle core' and 'proto-tortoise core'. The last type is the most frequent one. Two sub-types of 'proto-tortoise core' have been noticed. They are unfaceted and faceted platformed types in a 2 : 1 proportion. In this stage we find more emphasis......"On the production of definite forms of flakes" (Paterson and Drummond, 1962 : 68). The seventeen flakes are of unprepared, prepared and Levallois types, which correspond to all the available type of cores. Their "......platforms appear to be at lower angles than the earlier industries, as is to be expected with the development of the proto-tortoise core but there is still no evidence of fine faceting, as is generally found in true tortoise core technique" (Paterson and Drummond, 1962 : 69).

Late Soan

The Late Soan both stratigraphically and typologically has been divided into two groups, *i.e.*, A and B (De Terra and Paterson, 1939).

Late Soan A

Stratigraphically they come from basal gravel of terrace 2, which belongs to third glacial age. Though the artefacts consist of large flakes and choppers of 'Early Soan' type, yet there is another gravel which contains flakes and cores of advanced technology. The 'elongated Blade-like flakes and prepared cores clearly indicate that the assemblage belongs to 'Levalloisian' tradition and thus typologically falls into Middle Stone Age phase (De Terra and Paterson, 1939 : 309).

Late Soan B

This assemblage comes from the bottom of the thick Potwar loessic silt, which has been dated to the third glacial or interglacial stage. The 'Levallois' tradition noticed in Late Soan A still continues. Nearly 50% of the flakes show 'faceted striking platforms', with careful trimming of upper surface. The techno-typological analysis of cores and flakes of this assemblage makes it similar to the 'Levallois' tradition of Western Europe (De Terra and Paterson, 1939 : 310).

The Late Soan culture seems to be more wide spread, for, about twenty one sites of this phase were reported by De Terra and Peterson (1939).

Evolved Soan

The term is given to an assemblage coming from Dhok Pathan a site near Pindi Gheb by Movius (1943). It has been dated to fourth glacial period. Typologically the assemblage is similar to Early and Late Soan, but containing smaller specimens. Some new tools also appear in this phase. Among them, small awls are noteworthy.

The three traditions discussed above have been divided by Paterson and Drummond, into seven cultural stages, *i.e.*, Upper Soan A, Upper Clactonian A and B, Upper Soan B, Upper Soan Stellenbosch, Upper Stellenbosch, Upper

Acheulean Clactonian, and Final Soan, respectively. Each of these will be discussed in brief.

Upper Soan A

This has been associated with the gravel of third glaciation, 'Loess of Potwar,' thus belonging to Upper Pleistocene (Paterson and Drummond, 1962 : 43). This is one of the biggest assemblages of Soan Basin. The type site of this is Ghila Khan, which has yielded 120 artefacts out of 380 total tools. One third are flakes. Cores are also in similar proportion and the remaining are Soan type three, 'Bilateral flat-base (Paterson and Drummond, 1962 : 71). This does not come from a workshop site. Four types of cores have been noticed in the assemblage, *viz.*, pebble-core (1/3 of cores), assymetrical cores (1/10 of cores), biconical cores and unfaceted cores. The last one are 1/10 of the group, and their appearance denote the introduction of tortoise core in the industry (Paterson and Drummond, 1962 : 74-75). But still cores with faceted striking platforms are absent.

The group of flakes (for blades are absent) have been divided into two groups. The first group consists of unprepared flakes, which are infact by-product and are characterised by unprepared, cortical high angled platforms. Some of these by-products have been utilised as tools also (Paterson and Drummond, 1962 : 74). The other group consists of Levallois flakes.

On stratigraphical grounds the next trend is that of Upper Clactonian industries. This has been obtained from the top of basal conglomerate of Terrace 2, and has been dated to Upper Pleistocene. It has again been divided into two groups.

Upper Clactonian A

This industry consists of hundred specimens of which 40% are cores and 60% flakes. There is a total absence of Soan tool-types. Though biconical pebble and spindle cores are ten percent each, yet Levallois cores are 40% and Mousterian cores 30%. Most of the Levallois cores are unfaceted and only a few are faceted (10%). The proportion of Levallois flakes is almost similar to those of cores. The 'preparatory flakes' or waste flakes are comparatively very few. The assemblage belongs to Mousterian tradition, with considerable proportion of Clactonian element, and hence given the name 'Upper Clactonian' (Paterson and Drummond, 1962 : 89-91).

Upper Clactonian B

Two such localities from where this assemblage has been obtained have been noticed. The assemblage consists of a small 'disc core', 'double faceted tortoise' core, unfaceted tortoise core, and 'spindle core'. Pebble cores are absent. There are also triangular flakes (seems to be Levallois Points) and a few preparatory flakes. Most of the flakes of the last type have been retouched. The assemblage is "comparable to European Mousterian". The occurrence of Mousterian core in Upper Clactonian B suggests that the Soanian people and the makers of this industry were entirely different. This fact provides ground to the investigators to say that "The Clactonian here is therefore an intrusive culture and not an invading culture (Paterson and Drummond, 1962 : 92).

Upper Soan B

Stratigraphically the industry is contemporary with Upper Soan Stellenbosch and Upper Stellenbosch, and comes from basal gravel of Terrace 3. The industry comes from Adial locality, from where 600 artefacts were discovered. Core types of this group are more advanced than Upper Soan A type. Soan type-tools continue. Type 1, 6, 7 and 8 have also been noticed (Paterson and Drummond, 1962 : 76).

Cores are small and well made. Nine types of cores have been noticed in the assemblage. They are pebble core, asymmetical, biconical, single unfaceted tortoise core, disc cores and steep cores (Paterson and Drummond, 1962 : 79-80 Figs. 34-35). The total number of flakes is 233. Fifty-eight flakes are unprepared and the remaining are :

UNFACETED

(a) High angled platform	
(1) convex bulbs	28
(2) flattish bulbs	58
(b) Low angle platforms	
(1) convex bulbs	20
(2) flattish bulbs	26

FACETED

(a) High angled	1
(b) Low angled	—

(1) convex bulbs	17
(2) flattish bulbs	25

In the Table 3 they have given the proportion of flakes detached from various core types (Paterson and Drummond, 1962 : 81-82, Tables 2 and 3). Unprepared flakes are dominating along with all types of flakes corresponding to the core types.

This assemblage though more advanced than Upper Soan A is technologically less evolved than Upper Clactonian A and B.

Upper Soan Stellenbosch

The industry has been obtained from Margah and is characterised by Stellenbosch and Soan tool-types (Paterson and Drummond, 1962 : 100-101).

Upper Stellenbosch

The assemblage contains seven types of handaxes, cleavers, cores and flakes and is completely devoid of Soan-tools or pebble-tools. Three types of cores have been noticed. They are assymmetic (50%), proto tortoise core (20%) and disc cores (30%). Flakes are comparatively limited in number. The flakes obtained from preparation of cores and the manufacture of handaxes are quite frequent and those which could correspond to those of developed core types are absent. The assemblage, though stratigraphically contemporary with Upper Soan B, is less evolved in the technology of cores and flakes.

Upper Acheulean Clactonian

The assemblage was noticed at the site Chak Sighu, near Chauntra where it has been found associated with Potwar loess of Terrace 3 and thus can be dated to the Middle part of Upper Pleistocene. The four cores of the assemblage are of developed form. Three flakes have been struck from faceted platform and only one seems to be detached from discoidal core. Cores and flakes dominate the industry, along with a few Acheulean tools. Soan tools are not present. The industry is akin to 'Upper Mousterian' of Europe (Paterson and Drummond, 1962 : 93).

Final Soan

The small tools with fine flaking of 'Final Soan' tradition have been associated with fourth glaciation. The industry is reported from Dhok Pathan and

Pindigheb and consists of 343 artefacts. One hundred and seventy of them are the Soan type (1-6) tools and cores and the remaining are flakes. Only three types of cores *i.e.*, disc (25%) assymmetic (50%) and pebble (25%) have been noticed. The flake group consists of both massive, small, crude and well prepared flakes. There are 169 small flakes, among which many seem to have been removed from disc cores. Excepting a few disc cores, there are also other advanced forms, in this industry (Paterson and Drummond, 1962 : 84-87).

The discussion of all the seven industries is based upon their stratigraphical position, though techno-typological picture is some what different. Three distinct culture groups seem to exist in the Middle Palaeolithic phase of the area. The Soan tradition comprises pebble-tools which gradually evolved into flake industry. In this we have Upper Soan A, Upper Soan B and Final Soan. The other group shows Clactonian trend, which evolved into Levallois-Mousterian tradition. The assemblages associated with handaxe tool tradition and flake tradition have been called as Upper Stellenbosch. Besides, there are two groups which have mixed characteristics of the two tool-types, *i.e.*, Upper Soan, Stellenbosch and Upper Acheulean Clactonian. The general tendency in all these assemblages is towards more advanced techniques of flake detaching.

In the report, Paterson and Drummond have used new names for such specimens which are commonly known by specific term. To cite a few example, 'Oblates' is used for chopper and most of the 'Nucleates' are infact chopping-tools of Movius. The further eight divisions of nucleates..."are based on the appearance or shape of the tools, and relatively less attention was paid to logical categories from the point of view of manufacturing" (Kranz, 1974 : 77). Similarly, the terms used to describe technological features on cores and flakes are confusing. We are also at a loss to appreciate the hypothetical interpretation of certain typo-technological trends in terms of cultural-intrusions, when the number of specimens studied or obtained are so limited. Thus, expression like, 'Stellenbosch intrusion' and 'Clacton intrusion' cannot be justified.

It would not be out of place to mention, here, the recent discovery of Kranz. He obtained two hundred and ten implements from the exposed surface of boulder-conglomerate of second terrace, near Ghila Kalan (Kranz, 1974 : 66-82). The tool-kit from this site consists of chopper-chopping (34), discoidal flakes (105) Levallois like-flake (34), blade (16) and indistriguishable pieces (21).

Further west, a fullfledged Middle Palaeolithic cultural trend has been recognised by Dani in the Peshawar valley. The excavations conducted at Sanghao caves have brought to light three stages of Sanghao culture in succession (Dani, 1964). Inspite of a lapse in time, between the deposits of period I and II, the implements show one homogenous tradition, which has been referred to as 'Levallois-Mousterian heritage'. The excavator is of the opinion that the 'Upper Potwar loess' yielding 'Clacton' assemblages, is coeval with the Sanghao-industry which is associated with the younger loess of the Peshawar valley. The exposure and the study of this habitational deposit is important, for, after quite a long indulgence in the river valley sequence, the actual cultural context has been touched *in situ*.

East Punjab

This region can be divided into two small areas, *viz*., the Sirsa valley and the Beas-Banganga valley.

Sirsa Valley

The river Sirsa rises from the Kasanti hills and drains into the river Sutlej. The former along with its tributary *nalas* has revealed quite a few Lower Palaeolithic sites around Nalgarh in the foothills of Simla Himalayas. Overlying the Upper Siwalik formation exposed in Sirsa valley are the boulder, silt and gravel deposits of the Post-Siwalik phase. They form three terraces which are 70′, 40′ and 10′ high, and have been dated to Lower, Middle and Upper Pleistocene periods, respectively (Sen, 1955 : 178-79 also Mohapatra : 1974 : 208). The Lower Palaeolithic artefacts were found from the upper and middle terraces of the region. It was in 1951 when Oldfprufer for the first time discovered a few palaeoliths along with Cemetry H type of pottery. In subsequent years, Sen (1955), Y. D. Sharma (*IAR*, 1954-55 : 58) and Mohapatra (1974) investigated the area and besides studying the Pleistocene sequence enlarged the previously made collection of implements.

Sen and Mohapatra hold different views with regard to the material remains from the valley. According to Sen there is very little typological difference between the artefacts coming from the former two terraces (Sen, 1955 : 180). Except one proto-handaxe, the assemblage is completely devoid of Acheulean or Abbevillian implements. In Sen's collection pebble-tools (choppers and scrapers) dominate along with unprepared cores and flakes. Simple pebble-cores of flattish, round or discoidal forms, showing unworked undersurface and scars of big detached flakes on the dorsal surface have also been noticed.

Most of the flakes seem to be detached by Clactonian technique, which either have unprepared striking platforms or unfaceted striking platforms at high angle to the dorsal surface (Sen, 1955 : 181). The dorsal surface of the flakes, in most of the cases, is unprepared. Proto-Levallois flakes with faceted platforms occur rarely, but true Levallois flakes are completely absent. A few specimens have also been converted into crude scrapers, points, knives and borers. Waste-chips are conspicuous by their absence.

According to Sen, "The typological similarity in Nalgarh and Early Soan industries of West Punjab indicates that the former is an extension of the latter in East Punjab" (Sen, 1955 : 181-183).

Mohapatra on the other hand has claimed to obtain some important new types, which were absent in Sen's collection. On the basis of these, he feels that Sirsa valley industry presents many advanced features in technique and typology of tools (Mohapatra, 1974 : 208). In contrast to Sen, who has equated his finds with Early Soan of West Pakistan, Mohapatra compares his material with Beas-Banganga valley.

The tool kit filled up by Mohapatra, contains, prepared and unprepared flakes, thick-blade-like flakes, small scrapers, borers, bifacial discoids (recalling Mousterian technique), plus a fair proportion of pebble-choppers. Flakes though are numerous becomes smaller in size. Retouching has begun in this case. But "Inspite of all these advanced features, the Sirsa valley industry is still essentially an industry of pebble-tool traditian" (Mohapatra, 1974 : 209).

Two terraces were noticed by Mohapatra on the river Ghaggar, at a distance of less than ten miles from the area discussed above. The terraces at DERA KHARAUNI and CHANDI-MANDIR have yielded only a few implements (pebble-choppers and unworked ordinary flakes). They are thought to belong to Sirsa valley complex (Mohapatra, 1974 : 209).

Beas-Banganga Basin

The river Banganga is a tributary of the Beas. Originating from the glaciers of Himalayas near the north-east of Dharmsala, the Banganga joins the latter at a place four miles south-east of Guler. With a view to locating Pleistocene remains the velley lying in the Kangra district of Punjab was surveyed by a number of investigators. First of all B. B. Lal explored the region (Lal, 1956). Thereafter, a joint expedition of Geological Survey of India, Deccan College, Poona and M. S. University, Baroda, re-examined the area in 1957 (Sankalia, 1962 : 20). This team agreed with the observations made by Lal in respect to the terrace formations at Guler and Dhera. The recent most account of an investigation is presented by Mohapatra (1974). He seems to add more information about the material remains and also about Pleistocene formations of the region.

As is well known, the basic geological composition of Siwalik series, here, has bean formed as a result of erosional and accumulative activities in Middle and Late Pleistocene periods. Near Guler, on the banks of the Banganga, Lal noticed five terraces, whereas Mohapatra has reported the existence of seven terraces from the same region. The members of the joint expedition hold the view in favour of Lal (Sankalia, 1962 : 20). Lal picked up six palaeoliths from Terrace 1 (565′). The eighteen artefacts, associated with next terrace (375′), were obtained from the banks of *nalas* and slopes of the Terrace 2. The last implementiferous Terrace *i.e.*, Terrace 3 (225′), has yielded only ten specimens. The remaining two terraces *viz*. Terrace 4 (165′) and Terrace 5 (30′) are devoid of human activity (Lal, 1956 : 64-68). The seven terrace noticed by Mohapatra are—Terrace 1 (578′), Terrace 2 (395′), Terrace 3 (278′), Terrace 4 (218′) Terrace 5 (158′), Terrace 6 (98′) and Terrace 7 (28′). Pebble-tool assemblages were obtained from the first four terraces. The fourth terrace also yielded a flake industry and a few implements of polished stone tradition. In the list of four tool-yielding localities of Lal (Guler, Dhera, Dhalaira and Kangara), Mohapatra added fourteen others, which lie in between the fifty mile-stretch from Sujanpur and Talwara (Beas Dam site).

It is interesting to note that the implements obtained by Lal from the various terraces are similar to each other. The largest collection was made from GULER. The fifty-two specimens from the place are made on quartzite-pebbles, which are separable within the following types—choppers (424), chopping-tools (3), proto-handaxes (4), cores (5), and flakes (16). Two types were noticed in the group of cores *i.e.*, discoidal and non-discoidal. In the group of flakes, specimens obtained by Clactonian technique (12), outnumber that of proto-Levallois flakes (4). The former being twelve whereas the latter are only four.

Most of the flakes are said to have obtuse unprepared striking platforms. A few of these evidence little irregular retouching. Sankalia, who re-examined this collection, with Subbarao, is of the opinion that the percentage of genuine tools is very low (Sankalia, 1962 : 20). Joshi thinks that the factor responsible for chipping off most of the specimens is not human hands but natural agencies such as, tactonic activity. The author who had an opportunity to examine the collection is inclined to agree with Lal's claim that quite a good number of the specimens in the collection, evidence human workmanship.

The dominant trait in Mohapatra's collection as well, is that of chopper, both unifacial and bifacial types. "These are accompanied by a suitable proportion of flakes of small and big size" (Mohapatra, 1974 : 207). However, the exact number or proportions of these is not mentioned. Flakes are devoid of secondary working. According to Mohapatra "A very small number of flakes show flake-scars on the dorsal surface, resembling the prepared flakes, which to us appear to have been the results of the secondary trimming of some pebble-choppers. In this industry no distinct trait of flake-making is perceivable. Flakes at least at this stage are the natural accompaniment of the pebble-choppers" (Mohapatra, 1974 : 207).

While comparing the earlier cultural remains from the region Mohapatra writes, "If both the Beas-Banganga and the Sirsa valley industries are considered as two facies of one culture (*i.e.*, Early Soan or the pebble tool culture of the Indian Early Stone Age), the former is undoubtedly earlier in age and the latter its developed manifestation" (Mohapatra, 1974 : 209).

The existence of Middle Palaeolithic phase in the area has been only in the recent past claimed, and, is known from a few localities only. The 'Scraper-borer' element reported from Nalgarh, by Sen, is thought to be the part of the 'Middle Stone Age' trend by Sankalia (1962 : 20). But the first claim in this direction is made by Sahani and Mohapatra, who discovered a flake-industry in the region (Sahani and Mohapatra, 1964). A mention of such an industry has also been made by Mohapatra and this comes from a place called Ror. The main components of the Ror industry are—prepared flakes, asymmetric cores, side-scrapers and incipient borers (Mohapatra, 1974: 209). The pebble-side-scrapers, which look like miniature Sohanian pebble-choppers, indicate, that the pebble-tool tradition of this region according to Mohapatra continued to influence the later lithic industries or culture (Mohapatra, 1974 : 209).

Jammu and Kashmir

This is a proper place to mention the sporadic discoveries made in the area of Jammu and Kashmir. The valley of Ravi has proved to be potential in this respect. At Lakhanpur, four terraces were noticed. "A large number of tools were obtained from Terrace 2 at Kurro, Pinyani and Terra. These consisted of Pre-Sohan type of huge flakes, rolled and heavily patinated. Early Sohan unifacial pebble choppers and Clactonian and Levallois flakes. From the Terrace 3, pebble tools and flakes were picked up at Mah and Jagatpur" (*IAR*, 1965-66 : 19). Four types of choppers are said to be associated with three types of flakes *i.e.*, Clactonian, Proto-Levallois and Levallois. Their exact proportion is unknown to us. In subsequent years R. K. Pant and Puran Singh surveyed the area flanking the river Basantar, near the town of Samba in the district Kathua. More than fifty implements (comprising pebble-tools, discoids, flakes and cores) were obtained from the terrace at Nandi, Mananu and Paltha (*IAR*, 1968-69 : 9). Later, Sankalia along with R. K. Pant and S. Lal examined the area around

Pahalgaon and Liddar valley in Kashmir. Two artefacts were obtained here from the deposits assigned to the second glacial and second interglacial. The massive flake comes from the second glacial formation and the 'Abbevillian handaxe' from the junction of the second glacial deposit and the brown clay (*IAR*, 1969-70, 10-13.

CHAPTER III

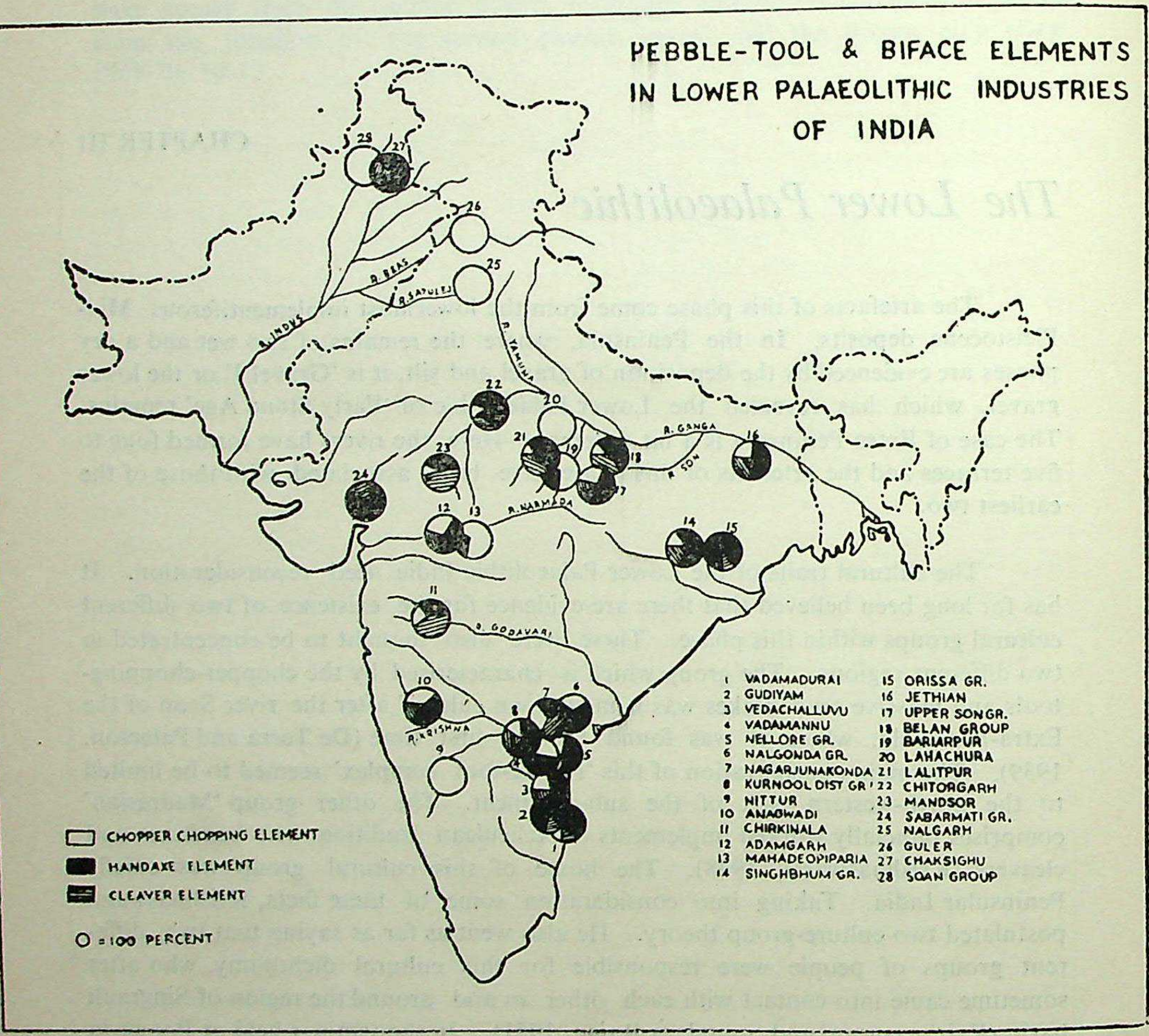
The Lower Palaeolithic

The artefacts of this phase come from the lowermost implementiferous Mid-Pleistocene deposits. In the Peninsula, where the remains of two wet and a dry phases are evidenced by the deposition of gravel and silt, it is 'Gravel I' or the lower gravel, which has revealed the Lower Palaeolithic or 'Early Stone Age' remains. The case of Extra Peninsula is a bit different. Here, the rivers have formed four to five terraces and the artefacts of this phase have been associated with those of the earliest two.

The cultural traits of the Lower Palaeolithic India need reconsideration. It has for long been believed that there are evidence for the existence of two different cultural groups within this phase. These were also thought to be concentrated in two different regions. The group which is characterised by the chopper-chopping-tools and massive crude flakes was named 'Soan culture' after the river Soan of the Extra-Peninsula, where it was found for the first time (De Terra and Paterson, 1939). The main concentration of this 'Pebble-tool complex' seemed to be limited to the north-western part of the sub-continent. The other group 'Madrasian' comprises bifacially worked implements of Acheulean tradition *i.e.*, handaxes and cleavers (Krishnaswami, 1948). The home of this cultural group was chiefly Peninsular India. Taking into consideration some of these facts, Krishnaswami postulated two culture-group theory. He also went as far as saying that two different groups of people were responsible for this cultural dichotomy, who after sometime came into contact with each other in and around the region of Singrauli basin (Krishnaswami and Soundara Rajan, 1951). In the seminar held at Poona in 1964, various aspects of this theory were discussed. At that time most of the prehistorians agreed about the separate entity of 'Soan culture' (Misra and Mate eds., 1965, 1-14).

Since 1964 quite a few evidences have come to our knowledge, in the light of which, the whole problem has to be re-examined. The indication of this is borne out by the map showing the distribution of typological trends of Lower Palaeolithic

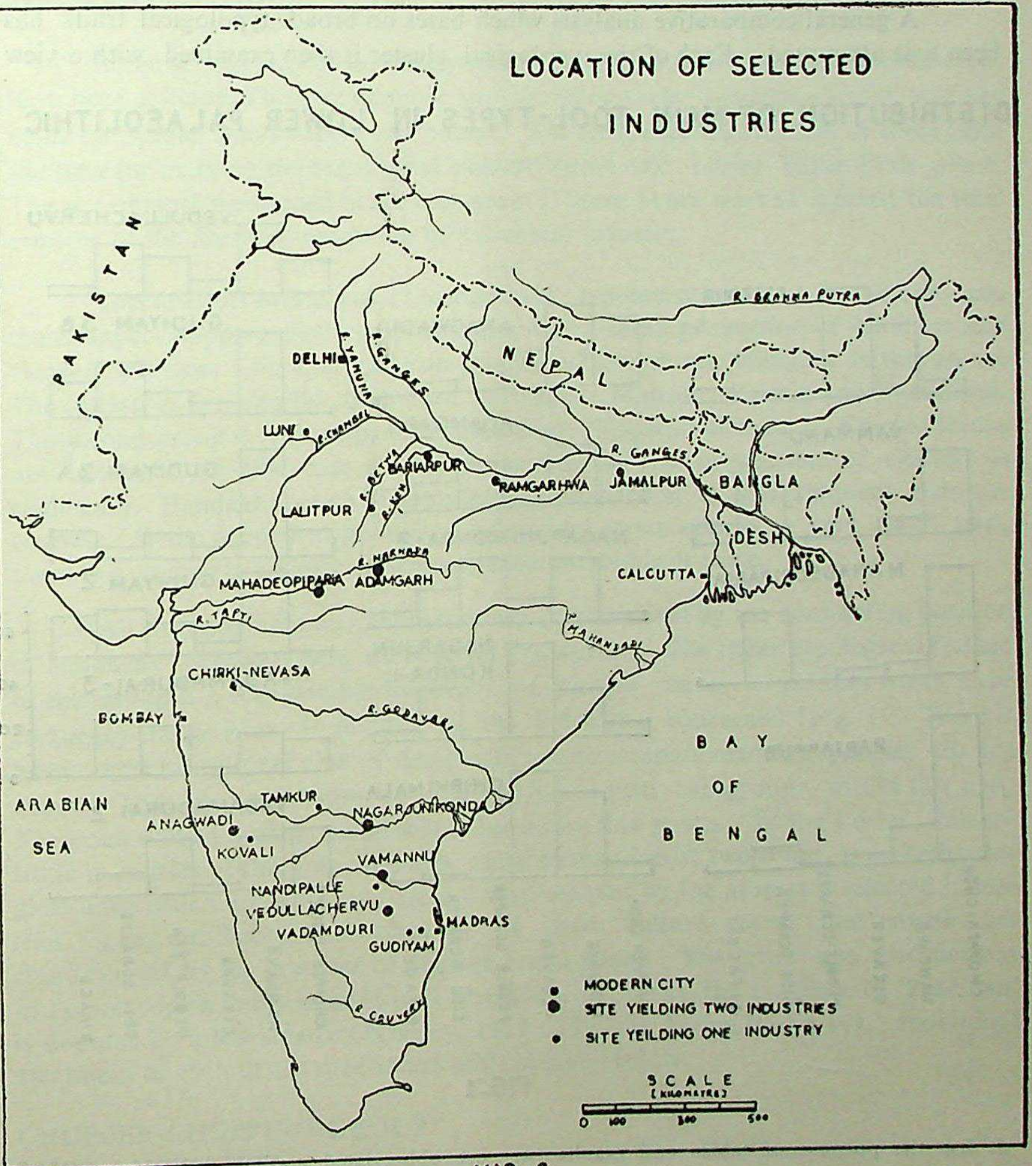
India. In the map it is not possible to mark two distinct regions for 'pebble tool' and 'handaxe cleaver' traits (Map No. 1) as was the case earlier.


PEBBLE-TOOL & BIFACE ELEMENTS
IN LOWER PALAEOLITHIC INDUSTRIES
OF INDIA
R. INDUS
R. BEAS
R. SATLUJ
R. YAMUNA
R. GANGA
R. SON
R. NARMADA
R. GODAVARI
R. KRISHNA
1 VADAMADURAI
2 GUDIYAM
3 VEDACHALLUVU
4 VADAMANNU
5 NELLORE GR.
6 NALGONDA GR.
7 NAGARJUNAKONDA
8 KURNOOL DIST GR.
9 NITTUR
10 ANAGWADI
11 CHIRKINALA
12 ADAMGARH
13 MAHADEOPIPARIA
14 SINGHBHUM GR.
15 ORISSA GR.
16 JETHIAN
17 UPPER SON GR.
18 BELAN GROUP
19 BARIARPUR
20 LAHACHURA
21 LALITPUR
22 CHITORGARH
23 MANDSOR
24 SABARMATI GR.
25 NALGARH
26 GULER
27 CHAKSIGHU
28 SOAN GROUP
CHOPPER CHOPPING ELEMENT
HANDAXE ELEMENT
CLEAVER ELEMENT
O = 100 PERCENT

MAP 1

Similarly, we have shown elsewhere that by applying Krishnaswami's, criterion, we get not two but at least four to five typo-technological variants within the palaeolithic collections but then, these can hardly be termed as seperate cultural units.

In the following pages, we have tried to present a detailed analysis based on techno-typological observations on some of the industries of the Lower Palaeolithic India:


LOCATION OF SELECTED INDUSTRIES
PAKISTAN
NEPAL
BANGLA DESH
DELHI
R. YAMUNA
R. GANGES
R. BRAHMA PUTRA
LUNI
R. CHAMBAL
R. BETWA
R. KEN
BARIARPUR
RAMGARHWA
JAMALPUR
LALITPUR
R. NARMADA
MAHADEOPIPARIA
ADAMGARH
CALCUTTA
R. TAPTI
MAHANADI
CHIRKI-NEVASA
BOMBAY
R. GODAVARI
BAY OF BENGAL
ARABIAN SEA
TAMKUR
NAGARJUNIKONDA
ANAGWADI
KOVALI
VAMANNU
NANDIPALLE
VEDULLACHERVU
VADAMDURI
GUDIYAM
MADRAS
R. CAUVERY
● MODERN CITY
● SITE YIELDING TWO INDUSTRIES
● SITE YEILDING ONE INDUSTRY
SCALE (KILOMETRE)
0 100 300 500

MAP-2

These are Vadamadurai 2 and 3; Gudiyam 2, 3A and 3B in the Kortalayar basin Vedullachervu in Chittoor district; Vadamanu in Cuddapah district; Anagwadi in upper Krishna basin; Nagarjunakonda 1 and 2; Chirki-Nevasa in Pravara basin Mahadeo-Piparia and Adamgarh in Narmada basin; Lalitpur in Betwa basin; and Bariarpur in Ken basin.[1]

A general comparative analysis which bases on broad typological traits has been first attempted. Each of the typological cluster is then examined with a view

DISTRIBUTION OF MAIN TOOL-TYPES IN LOWER PALAEOLITHIC

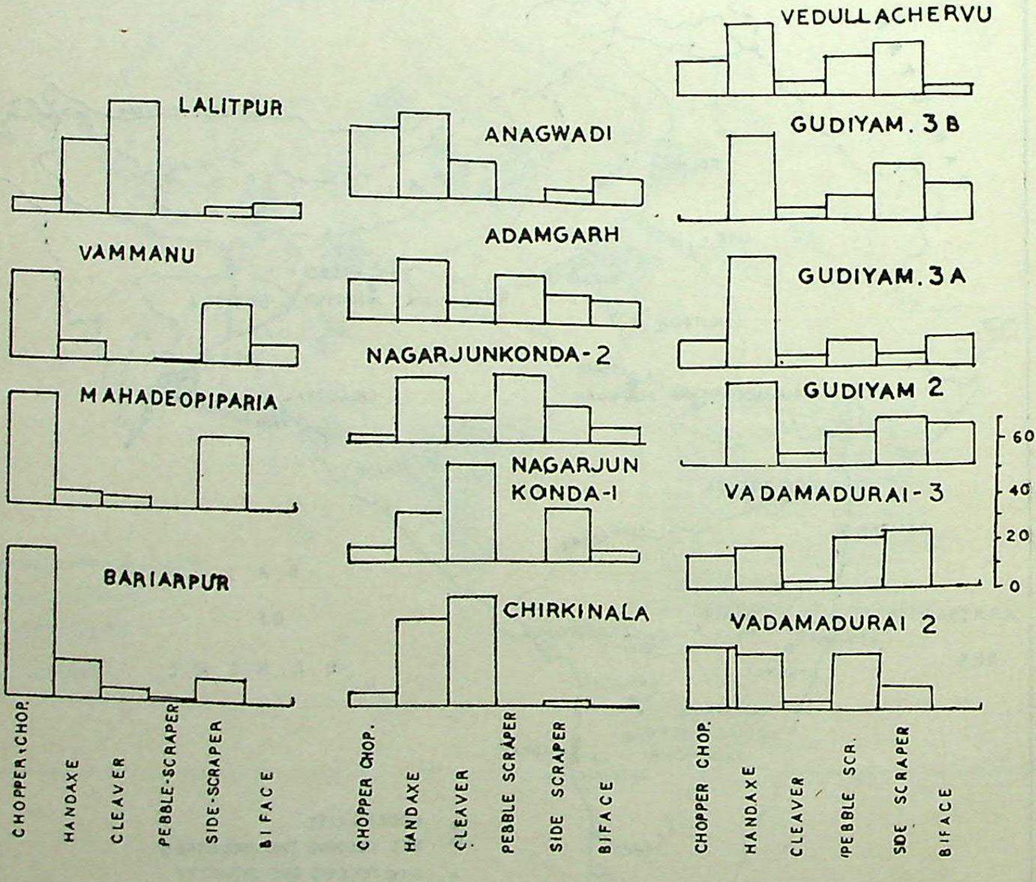


FIG. 1

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[1] for the purpuse of tables and graphs they are abbreviated as-VDM-2, VDM-3, GDM-2, GDM-3A, GDM-3B, VDCH, VMN, ANG NGK-1, NGK-2, CHRN, MPR, ADG, LTP, BRP respectively.

to finding out their distribution and technological characteristics. We have also tried to explain typo-technological peculiarities met within this process.

The whole typological data of the Lower palaeolithic phase in the first stage has been given in the form of the Table 1, which contains exact number of individual implement types.

In the second step of our analytical investigation, six main implement-types have been selected. They are chopper and chopping-tools, handaxe, cleaver, scrapers made on pebble, side-scrapers and biface. The frequency distribution of these form the base for marking the typological clusters within the Lower Palaeolithic phase. The percentages mentioned in the histogram (Figure 1) are worked against the total number of the finished tool-group of individual industry.

This analysis brings out a few apparent typological units. In the first case, the chopper-chopping group preponderates with a small proportion of handaxe and cleaver elements. Scraper made on pebble and biface, are negligible in this group. The industries forming this group are Bariarpur, Mahadeo-Piparia and Vadamanu. The second group is formed by three industries—Nagarjunakonda-1, Chirki-Nevasa and Lalitpur. In this case a marked increase in the proportion of cleavers is significant. Handaxe though in considerable proportion is less frequent than the cleavers. While chopper-copping and biface tool group occupy a very small part, there is a complete absence of scraper made on pebble in these.

All the remaining nine industries are characterised by the dominating position of handaxes. Cleavers here are in lower proportion. The other typological feature of this group is a considerable frequency of scraper made an pebbles which have frequency range from 10 to 28% in the industries concerned (Fig. 1). There is however an exceptional case of Anagwadi, where scrapers made on pebbles do not occur. There is a possibility of finding typological sub-groups within this unit. The point will be dealt in detail while discussing this group. In the Lower Palaeolithic industries of this sub-continent, there seems to exist two other typo-technological units which unfortunately are not respresented by the aforesaid selected industries. They are 'Pebble-tool complex' or 'Soan culture group' and assemblages characterised by the presence of massive crude flakes. The latter was also noticed in Potwar region and was known as 'Pre-Soan'. At times, the existence of 'Pre-Soan' is doubted by a few scholars (Oakley, 1957 : 199-209; Misra 1965 : 10). Individual treatment of each of the mentioned units is given below.

CHOPPER-CHOPPING GROUP

As it is evident from the name, this group is characterised by an overwhelming presence of chopper and chopping implements made usually on pebbles. The tools of Acheulean tradition namely handaxe, cleaver etc., are conspecious by their absence in this. The tool-kit containing such implements has generally been named 'Soan culture' or 'Pebble tool culture'. Our preference for the name 'Chopper-chopping group' instead of the well known terms, is to avoid many contradictions. For example, 'pebble-tool' is a very general term which can include a number of artefact-types which though made on pebbles do not characterise the group of chopper-chopping. To cite an example, the scrapers made on pebbles consistently occupy a good proportion of the Handaxe-cleaver group, while they are completely absent in the group under discussion. The term 'Soan culture' has a particular geographical significance, hence do not has an universal application. Besides, we are not certain whether the said groups of small assemblages can legitimately be named as culture.

The concentration of chopper-chopping group in Potwar region is well established. Besides, the tools of this group are also reported from Sirsa, Beas-Banganga and Kangra valleys of the Extra-Peninsula. In the southern regions, noteworthy remains are reported from Lahchura, Bhimbetaka, Konkan and Nittur. The last named forms the southern most limit for the extension of the group under discussion. Recently the remains belonging to this group have also been reported from the Garo hills in Assam (Sharma, 1975). We propose to discuss the Soan group of the Extra-Peninsula first and the other discoveries thereafter.

As discussed in the preceding chapter the Pleistocene Archaeology of Potwar region is known to us chiefly by the two investigations *i.e.*, those of De Terra and Paterson and Paterson and Drummond. In the early publication (De Terra and Paterson, 1939) though a much detailed account of the climatology has been given the techno-typological description of the associated artefacts is unsatisfactory. However, the point has been dealt in detail in the later publication, where Paterson and Drummond (1962) have also tried to assign full cultural significance to their discoveries. Abstracts from their account is under study. According to the investigators a continuous cultural sequence is found in the region of their study. Lower and Middle Soan A and B assemblages seem to belong to Pebble-tool complex of the Lower Palaeolithic phase as they have been assigned to Middle-Pleistocene period. In all the three assemblages chopper and chopping-tools made on pebbles are the only component of the finished tool group. There is also a peculiar pebble butted implement with a point which is named Soan type 5 by the investigators (Paterson and Drummong, 1962 : 60). The number of cores and flakes are quite limited as compared to the pebble-tool group. Flakes which are more than cores show a cruder technique of manufacture. But there is a definite occurrence of Levallois element in the group of cores. The investigators have found evidence for a gradual technological evolution. The development of flake-detaching technique in this is distinctly marked from crudest Clactonian technique to 'proto-Levallois'. This suggestion should not be taken as the last word as according to Sankalia "... statements like these show implicit faith in the theory of chronological development. But when the number of tools is woefully small such statements are of little validity" (Sankalia, 1967 : 21).

The useful information from this account is, that, the chopper-chopping assemblages of the Potwar region have definite association with 'proto-Levallois', prepared core and even Levallois techniques. And, as the remains of the later period indicate, the growth of typological features remained somewhat static in this region. Nevertheless, there was spontaneous development of blank-detaching-techniques.

In the valley of Sirsa Lower Palaeolithic artefacts were reported from the upper and middle terraces. Chopper-chopping complex here is accompanied by unprepared cores and flakes. According to the investigator, proto-Levallois flakes with faceted platforms occur rarely and there is a complete absence of Levallois element (Sen, 1955 : 181-183). If, however, one were to go by the illustrations accompanying the above reports the collection do contain a few imperfect or even good pieces of Levallois. Besides, the said Clactonian flakes seem to be unprepared flakes obtained during the manufacturing of pebble implements.

The chopper-chopping group obtained by Lal (1965) and Mohapatra (1974) from Kangra valley comes from Dhalaira, Kangra, Dhera, Haripur and Guler. The collection from GULER, made by Lal was made available to us. Accordingly we proceed on the assumption that the collection is representative of the area.

The total number of fifty-two specimens available are made on quartzite pebbles. Among these, chopper-chopping group comprises twenty-seven specimens, which form 51.9% of the total. Choppers are twenty-four and the other type only three. Both the chopper and chopping-tool groups are boldly worked. Their working edge is pressed by a few deep scars of the working edge. Besides, there are pointed unifacially worked specimens. The nature of working on these resembles the former group, but due to the pointed tip and roughly oval shape, they have been assigned the name 'proto-handaxe' or 'pebble butted handaxe' by Lal (1956 : 60-61). This group of specimens seems to correspond with the 'Soan type 5'. Cores number only five (8.6%). Lal has grouped them within 'Discoidal' and 'Non-discoidal' types. But according to our observations most of them carry initial preparation marks on dorsal and some times also on the striking platforms (PL. XXXVIII). However, one round core can be grouped within the prepared core type (PL. XXXVIII). The dorsal surface in the last named is prepared from the sides, but it retains a patch of cortex in the middle. Preparation of striking platform is evident by the bold working at the left side. Flakes also occupy a good proportion (30.8%). Most of them seem to be by-products, obtained during the manufacture of chopper and chopping-tools. The flakes of this type are characterised by cortexed dorsal and striking platforms. At times a few unplanned half negatives on dorsal and striking platforms are visible. A mechanical classification of some of these specimens can enable them to be grouped within prepared flakes. But a conscious study will provide evidence of their by-productive nature. The usually big platform of these flakes has an angle range of 90°-113°. Though a number of them are irregular in shape, a few also are well formed *i.e.*, round and oval. The traces of the latter group can generally be seen on choppers and chopping-tools as well. The size of this group ranges between 80.0 to 65.0 mm having a general size-average-mean of 73.0 mm. It may be noted that the general size-average of the flake-scars measured on chopper and chopping-tools lie between 70 and 50 mm. Most of these are incomplete and do not reveal the actual size of the resultant by-products. Hence the size-average range of this group of flakes tallies well with the assumed size of the flake-scars on chopper-chopping group.

The other group of flakes, which are less in number, are massive in size, *i.e.*, size-average 125 to 197 mm with a mean of 149 mm. At least two of these five are well prepared and were probably detached from Levallois cores. They have faceted and unfaceted striking platforms and their angle between the striking platform and flake surface are 107° and 100°. The others though are of roughly similar size they contain only a few marks of preparation which are preliminary in nature. The tradition of retouching the flakes is negligible in this assemblage. Discussing the typological features Lal postulates... "Nalgarh-Daulatpur-Dhera-Guler belt represents stage when chopper-chopping tool industry had not come in contact with the Madras bifaces" (Lal, 1956 : 86). In the collection of Mohapatra from the Beas-Banganga region, a similar trend has been percieved.

The chopper-chopping-tool group of the Extra-Peninsula has a few by-products included under unprepared flakes, which are often named as Clactonian. There are also partially prepared or prepared flakes and corresponding cores such as 'proto-Levallois' or 'proto-toirtoise'. We feel that there is a strong possibility for the existence of Levallois technique in this region.

The plains of Ganga-Yamuna doab are devoid of Paleolithic remains. To the south of doab continuous to it is the locality LAHCHURA. Pant has reported 'a full blooded Soan culture' from this site (Misra and Mate, 1965 : 8). Recently, a large collection was made by him and the present author. In this assemblage, chopper worked at high angle with shallow neat scars preponderate. Their percentage being 68-70%, of the total collection. Chopping-tool form only 15% and there are a few pointed chopper or proto-handaxe. As mentioned earlier the flakes of this group are by-products and are characterised by pebble-surfaced dorsal and striking platform. A few of these are also seen with unfaceted platforms. Flakes form 25% of the collection and no core was discovered. On the banks of river Betwa near Jhansi an assemblage similar to Lahchura was obtained by the same team.

The survey of KONKAN area by Joshi and Boperdikar has revealed nine such localities which have yielded artefacts of the group under discussion. The investigators have noticed only choppers and proto-handaxe in the finished tool group. The preponderate type, choppers, are made on pebbles or nodules by steep (60°—85°) shallow scars. 'The working edges are even and less serrated and are mostly convex'. (Joshi and Boperdikar, 1972 : 50). There is one discoidal bi-pyramidal core and four flakes.

The excavations of a group of rock-shelters at BHIMBETKA, (near Bhopal), By Wakankar, seem to yield a pebble-tool horizon. The pebble-tool phase (Period IA) here, is claimed to be separated from the Acheulean phase (Period IB) by a 60 cms thick sterile layer (Wakankar, 1973 : 25-26). Misra, excavating another group of shelters at the same place holds the opposite view. According to him there is no evidence to separate the pebble-tools from that of Acheulean implements on stratigraphic grounds, as both occur together. As the work in this locality is in progress, one has to wait for the confirmation or rejection of Wakankar's observations.

On the bank of the river Tungbhadra, in the district of Mysore, Ansari discovered mineralized bones of *Bos* along with a few palaeoliths (*IAR* 1963-64 : 24). According to the investigator, the assemblage from NITTUR in that region is techno-typologically similar to the Soan industries of the North-western Punjab (Ansari 1970). If it is true, Nittur is the southern most site of chopper-chopping group, and also an isolated example of the socalled 'Soan tradition' amidst the 'Handaxe culture cluster'.

The author was able to examine the tool kit coming from Nittur, in the Deccan College, Poona. It is proposed to mention the typo-technological character of the assemblage on the comparative account of Ansari's and the present author's observations. The implements are made on quarzite and rough grained chert pebbles. In the total number of thirty-one artefacts belonging to the 'Early Stone Age' tradition, Ansari excludes five as rejects. The number of artefacts classified by us under this group tallies well with the total number discussed by the investigator, if we drop the five rejects. Ansari has used the term 'unifacial chopper' and 'bifacial chopper' for chopper and chopping-tools. His scrutiny of this group includes unifacial choppers—11; bifacial choppers-13 and flakes-2 (Ansari, 1970), whereas, we could notice ten choppers (forming 38.4% of the total); eight chopping-tools (36.4%); two massive flakes (7.6%), five prepared cores (19.2%) and one pebble-scraper (9.6%).

The aforesaid dispute with regard to the classification of the collection from Nittur is based mainly on some such specimens as the one illustrated by PL. XI, 4 and 5. In our opinion they are cores rather than 'bifacial choppers' as suggested by Ansari. Similarly the specimen of PL. XI, 1 of this dissertation (cf. Ansari, 1970; Fig. 1-6) is a scraper on pebble rather than an unifacial chopper with concave cutting edge.

There is no corresponding flake for the five prepared cores, for the size-average of the flakes is 110 mm and the mean of the size-average of the flake-scars on cores is 45 mm. Hence the size of the flakes in hand (80 and 140 mm) is much bigger than the biggest scar occurring on these cores. The two associated flakes are massive and have preliminary preparation of the dorsal surface and the striking platform *viz.*, one has unfaceted and the other faceted platform. The angle between the striking platform and the flake surface is considerably wide *i e.*, 120°-115°. On one of these specimens marks of secondary working is visible. (Pl. XI, 3).

Though the collection is too small for drawing any definite conclusive remarks, yet the striking feature of this group of artefacts is quite obvious namely—the occurrence of pebble-tools along with a few Clactonian flakes, as well as specimens formed as a result of the prepared core technique. This is shown by the presence of choppers, chopping-tools, Levallois cores and Clactonian flakes in the order of frequency. An intensive investigation in the region is needed. This might reveal some important features of this lithic tradition.

In the Indo-Pakistan sub-continent, the aforesaid assemblages are the sole component of the group of chopper and chopping-tool, to the best of our knowledge. Whether it is an individual cultural group and or has separate entity with in the Lower Palaeolithic tradition of the sub-continent is yet to be worked out. In this context it might be suggested that detailed morphological studies of the chopper and chopping-tool of this group should be taken up. This in our opinion will help us in reaching a solution to the above problem. In addition, a comparative analysis of this group of implements with the other groups i.e., chopper-chopping tools occurring along with the handaxe-cleaver group, may help us in understanding the promising techno-typological characters of this group. In the present state of our knowledge the distribution map does not reveal any clue with regard to their concentration in specific areas; movement from original place etc. Intensive and conscious field investigations should be planned in and around the regions from where this group has been reported.

PEBBLE-TOOL AND HANDAXE-CLEAVER GROUP

The chopper-chopping-tools are found in this case in association with only a few handaxes and cleavers, but the choppers and chopping-tools far outnumber the latter.

The three representative industries of this group in the sub-continent are BARIARPUR, VADAMANU and MAHADEO-PIPARIA. It is worth-noting that the three industries belong to three different regions and are quite away from each other. Bariarpur is situated in Ken basin (Joshi, 1961), Mahadeo-Piparia in Narmada basin (Supekar, 1968) and Vadmanu in Cuddapah district of Andhra (Reddy, 1968). The surroundings of these three are quite different. Bariarpur is surrounded by three different typo-technological units. Reminiscent of handaxe-cleaver is reported from Belan and Son basin which marks the eastern area. The cleaver group represented by Lalitpur forms the western scurts and chopper-chopping is obtained from the north (Lahchura and Jhansi). Mahadeo-Piparia and Vadamanu are surrounded by handaxe-cleaver group only. The nearest chopper-chopping group is represented by Nittur, which is quite far from the two (cf. Map 1). All the three industry have been dealt separately in the following pages.

Made on medium to fine grained quartzite, the industry of VADAMANU, comprises one hundred and fifty artefacts. This does not include five such specimens, which though grouped under artefacts by the investigator have been rejected by us (cf. Reddy, 1968). The four-fold division of this tool kit is finished-implements 62.6%, cores 1.3%, blanks 50.0% and diverse 5.3%.

Handaxes have been made in Acheulean tradition. Fifteen handaxes have pebble butt and are comparatively cruder than the five which are made on cores and one on an undetermined type of flake. Biface which form 9.4% of the finished tool group corresponds in workmanship with the latter group of handaxes. A majority of the finished implements is made on cores rather than on the flakes *i.e.* 2.7 : 1. Out of thirty-three chopper and chopping tools ten are made on thick unprepared flakes. Proportion of side-scraper made on flakes is noteworthy (21.0%). Points form negligible proportion here (3.1%; also cf. Table 1).

TYPO-TECHONOLOGICAL FEATURES OF CHOPPER-CHOPPING & HANDAXE GROUP

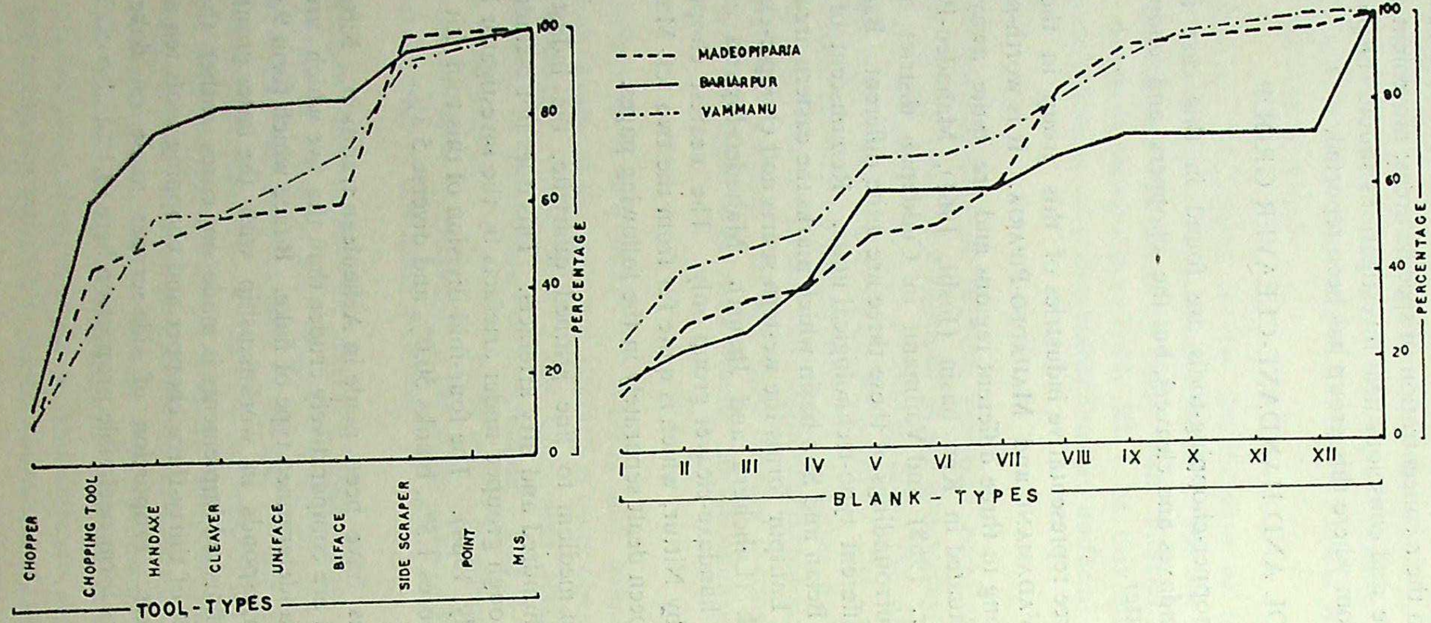


FIG. 2

The two cores of the industry are of unprepared type and are made out of round and irregular shaped pebbles. Their size is 170×115×73 and 92×58×32 mm. The length-breadth average-mean of the complete negative scar on them is 86.5 mm. With regard to the technological character and size, nineteen flakes of the industry tally with those of cores and the scars on them. These flakes are unprepared and have 88.5 mm as their length-breadth average mean.

In the group of flakes about one third are converted into finished implements *i.e.*, the ratio between the simple flakes and finished tools made on flakes being 2.8 : 1. Another noteworthy feature is that for making finished implements, in this industry, flakes showing cruder flake detaching techniques have been preferred against the partially prepared, prepared and Levallois flakes (cf. Table 3).

There seems to be an overwhelming preference for unprepared flakes over those which show marks of partial preparation on dorsal surface or striking platform or both, against prepared and Levallois flakes (cf. Table 2). It is interesting to note that as many as 64% of the flakes show either unfaceted or faceted striking platforms (cf. Table 3). Another striking technological feature of the industry is the occurrence of more broad flakes in number than elongated ones (cf. Table 4). Seven flakes are such which seem to be detached for making handaxe but were left unfinished. Their size average-range is 102.5 to 128.2 mm with a mean of 118.5 mm. All these are elongated and oval shaped. The general size mean of the flakes converted into chopper and chopping-tools is 98.3 mm only.

The artefacts of BARIARPUR industry are fashioned out of medium grained quartzite pebbles. The total number of one hundred and eight artefacts contain 87.0% finished tools, 2.4% cores, 22.3% flakes and 5.5% diverses.

As per Table 1, the handaxe-cleaver group has been out numbered by chopper-chopping tools. Handaxes made in Acheulean tradition were usually fashioned out of cores (4 : 1), whereas except for one all the cleavers with the solitary exception of one example, are made on flakes (1 : 4). The ratio between finished tools made on cores and those on flakes is 3.4 : 1.

The three cores of the assemblage are divisible within two types—(i) core with preliminary preparation on the dorsal surface and prepared striking platform and (ii) Levallois core. The core with preliminary preparation of the dorsal surface and the prepared striking platform is a rounded specimen and measures 98×90×60 mm. The one flake detached from it has left 78×76 mm (average 77.0 mm) scar. The size of this scar is slightly smaller than the size-average-mean of the corresponding flakes of the industry (81.0 mm). The Lavallois cores are round (85×80×47 mm) and broad (48×66×35 mm). No flake has been detached from these. The other noteworthy feature is that no Levallois blank was recognised in the assemblage.

Since the number of blanks and cores is so small in the industry, it is difficult to single out any particular flake detaching technique and regard it as a characteristic feature. However, it may be pointed out that the flakes denoting cruder technique seem to dominate the industry (cf. Table 2). The length-breadth average of the flake group ranges between 36.0 and 87.7 mm with a mean of 70.6 mm. The smallest flake belongs to the flake with unprepared dorsal surface and prepared faceted platform type. Besides, most of the flakes are oval shaped (ten out of eighteen). Flakes with unfaceted striking platform are most frequent and are followed by unprepared striking platform.

The excavations of boulder conglomerate deposit at MAHADEO-PIPARIA, have yielded eight hundred and two 'Early Stone Age' implements (Supekar, 1968). Six hundred and eighty-five artefacts from these were made available to us for first hand study. All of them are made on coarse to medium grained quartzite pebbles. Finished tools are 245, forming 35.7% of the collection; cores 43, 6.2%; blanks 480, 70.0% and diverse 30, 4.3%.

The proportion of finished tools made on flakes and cores are roughly equal (1 : 1.1). The dominant tool type is chopping-tool 36.3% followed by side-scraper on flake (cf. Table 1). Handaxe and cleaver occupy a subsidiary position *i.e.* 6 6% and 5.0% respectively.

Seven types are noticed in the group of cores. The dominant type in this group consists of core with prepared dorsal surface and prepared striking platrorm (39.4%). One hundred and ninety flakes correspond with this group of cores. Cores showing Mousterian technique and blade-cores are absent, though knowledge of blade detaching technique is marked by nine blades in the industry.

The industry is characterised by a very high proportion of blanks (70%). Flakes with prepared surface dominate. But the characteristic technological feature is marked by massive unprepared or partially prepared flakes. The massive ones can be regarded as 'Clactonian flakes' and the smaller ones 'by-products'. Typical Levallois element is nominal along with small proportion of blades. Our analysis also indicates the fact that mostly flakes showing cruder blank-detaching techniques have been converted into finished tools and on the other hand advanced blank types hardly show any signs of secondary working.

Besides, the industry, though devoid of handaxes made on flakes, seems to contain atleast twenty massive flakes resembling the shape of a handaxe. Twelve cleavers have been made out of flakes and at least nineteen flakes seem to have been left unworked, though agreeing with the size and shape of a finished cleavers. It is interesting to note that no such flake has been noticed in the group comprising unprepared and Levallois type of flakes. The measurement-mean of the flakes of this type is 128.5 mm, which is approximately 32.0 mm bigger than the measurement-mean of such flakes which seem to be detached for small tools like scrapers and points.

Elongated flakes dominate the industry, followed by oval, round, broad and irregular-shaped flakes. In the group of prepared flakes oval and elongated flakes appear more frequently, whereas, round and oval shapes are predominant in the Levallois group of flakes.

Like most of the palaeolithic industries, blanks with prepared but unfaceted striking platforms occupy a dominating position in this industry also. Unprepared striking platforms are also quite frequent. Faceted striking platforms form only 17.5% of the total blank group. The angle-mean of the second type is the highest, followed by the third and the first types, respectively.

It would not be out of place to mention that the industry of the earlier phase of Mahadeo-Piparia is quite different from the other Lower Palaeolithic industries of the Narmada basin. The later are characterised by Handaxe-cleaver group.

The general typological feature of this group is the predominance of chopper-chopping-tool over Acheulean implements, namely handaxe and cleaver. The handaxe-cleaver element is nearly 30% lower than the former group. Besides, side-scrapers made on flakes are also in considerably good proportion. The technological character of this group is seen in the presence of a good proportion of unprepared flakes and flakes with unprepared dorsalsur face and prepared striking platform. Levallois technique is poorly represented (cf. Fig. 2). Inspite of these general typo-technological trends, minor variations are evident from the cumulative curves (Fig. 2).

The cumulative curves illustrating the comparative position of the tool-types within the three industries reveal that a close typological affinity lies between Mahadeo-Piparia and Vadamanu industries (cf. Fig. 2). But considerable variation is evident in Bariarpur industry. The main difference lies in the very high frequency of chopping-tool in it. Bariarpur also falls behind the other two in the comparative analysis of technological trends (cf. Fig 2). In this case though minor variations prevail within the frequencies of former blank-types—the curve does not get boosted up due to the zero percentage of flakes-types VI, VII, X, XI and XII. Whereas, in the case of Mahadeo-Piparia and Vadamanu though 10% variation exist at the very starting point of the curves, both have a general tendency to rise. With the result that they cover up the 10-15% difference, before reaching blank-type VIII (prepared flake with unfaceted platform). In the earlier types *i.e.* I, II III, IV, V and VII, Mahadeo-Piparia is more close to Bariarpur than the Vadamanu. Whether the considerable difference noticed at Bariarpur is due to the sampling error (as the collection is made from the surface) or is the influence of it's northern components *viz.*, Chopper-chopping group, is difficult to say. There is also a possibility that the basic nature of this assemblage was akin to 'chopper-chopping tool' group wherein the handaxe-cleaver element was an accidental mixture. If the said element was an integral part of the industry, can it be suggested that it was the inspiration of 'handaxe-cleaver' tradition of the east. Only further investigations can throw adequate light on the true nature of the industry.

To investigate the size of flakes within this group length-breadth-average of individual flake of all the three industries has been first calculated. The data, thus acquired, is being presented in the form of histogram. The size-group of 30 mm unit forms the base of the vertical axis of the frequency-bars (Fig. 5). The flakes have been screened according to the preparation of their dorsal surface.

The size of the flakes in this group range from 40-69 to 160-189 mm, but the representative size-groups are 70-99 and 109-126 mm. The other noteworthy feature is that not much size variation is evident within the four technological groups. In Bariarpur industry, however, most of the unprepared ones are comparatively bigger than the prepared flakes. The latter fall within 40-69 mm. In case of unprepared only a few belong to 70-99 mm unit while the remainings fall within 100-129 mm. In the case of partially prepared 60% belong to 70-99 mm size group whereas 30% to the 40-69 mm and the remaining 10% to 100-129 mm.

Representative size-group in all the four types of flakes in Vadamanu, remains in the range of 70-99 mm. Minor differences of frequencies in the distribution of size of the remaining blanks have been noticed.

The flakes of Mahadeo-Piparia are generally bigger than that of the other two industries. The size-range in unprepared and partially prepared flakes of this industry is 70-99 to 160-189 mm units. Prepared flakes also fall within 40-69 mm unit, but all the Levallois flakes have size-average between 70-129 mm. The representative size-average units in Mahadeo-Piparia are 100-129 and 70-99 mm.

With the help of frequency bars, it is proposed to bring forth the distribution of long, broad, oval and round shaped flakes of chopper-chopping group (Fig. 7). Besides revealing the actual picture the frequency bars can also be used for comparing this group with the other Lower Palaeolithic typo-technological units (cf. Figure 7). The factual position revealed by it is that the elongated flakes are almost in equal proportion in all the three industries of chopper-chopping and Handaxe-cleaver groups. The frequency variation among these being only 1 to 6%. Broad flakes are more numerous in Vadamanu (29%) than in the other two (MPR-15% and BPR-11%). The high frequency reached by oval shaped flakes in Bariarpur is noteworthy. In the same industry round flakes are 12% less than the others. Except with regard to the position of broad flakes, where Mahadeo-Piparia has varyingly high proportion, Vadamanu and Mahadeo-Piparia show close affinities. This trend was also well marked in the comparative analysis of typological as well as technological aspects. But in respect of size of flakes, Bariarpur and Vadamanu seem to be closer (cf. Fig; 5).

HANDAXE-CLEAVER GROUP

This is the most dominant group of the Indian Lower Palaeolithic phase and has been reported from almost entire of the Indo-Pakistan sub-continent. The home-land for this being the Peninsula. In the Extra-Peninsula, later investigations have brought to light about half a dozen assemblages of this group. The discoveries from Chauntra, Rawalpindi, Adial and Chakri in the Soan valley and Gariala and Chaksighu in the Indus have been interpreted by Paterson as 'Stellenbosch-invasion' in the Soan culture-region (Paterson and Drummond, 1962). The nature of evidence is very meak for such interpretations. The only valid information acquired by the account is, the existence of the handaxe-cleaver trend in the Potwar region, which was heitherto unknown.

The trend has very wide distribution in the Peninsula, where all the Mid-Pleistocene deposits have yielded remains of this group. Besides the nine industries examined in detail below, the other important finds have been reported from—Nalgonda (Reddy, 1968), Nellore (Aiyappan, 1942), and Kurnool districts in Andhra, Malaprabha-basin (Joshi, 1955), Chambal-basin (Misra, 1967) Damoha area (Joshi, 1961), Bhimbetka and the neighbouring areas in the Raisen district (Misra, 1974 : also Wakankar, 1973), Upper Soan valley (Ahmed, 1966 and also recent work by Sharma,), Godavari and Pravara basins (Sankalia, 1952), Jethian valley (Narain, 1969), Belan valley (Sharma, 1968), Mayurbahnanj (Bose and Sen, 1948) and the other parts of Orissa (Mohapatra, 1962), Chaibasa in Bihar (Ghosh, 1971) and Sisunia in West Bengal (Das Gupta, 1971) etc.

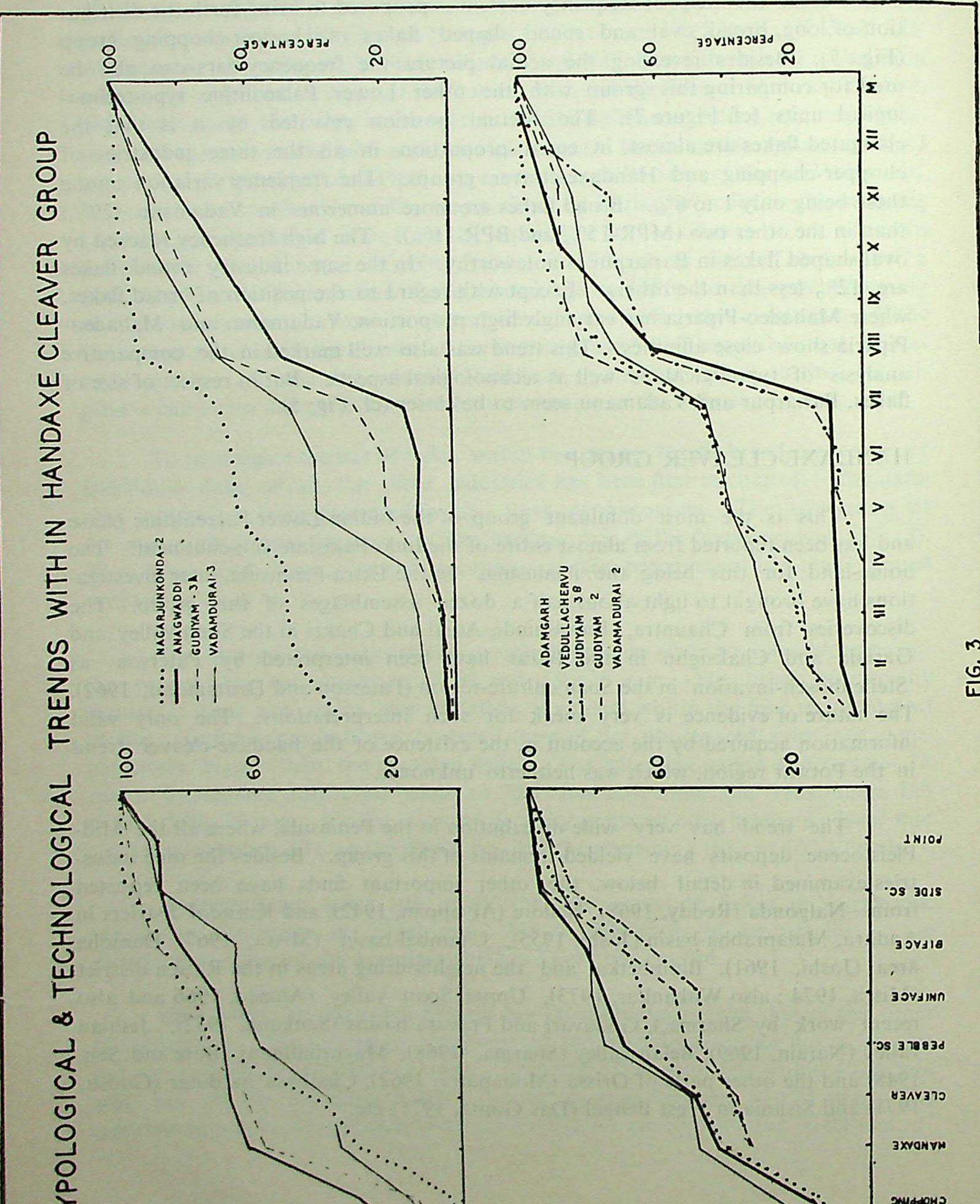

TYPOLOGICAL & TECHNOLOGICAL TRENDS WITH IN HANDAXE CLEAVER GROUP
NAGARJUNKONDA 2
ANAGWADDI
GUDIYAM - 3A
VADAMDURAI - 3
ADAMGARH
VEDULLACHERVU
GUDIYAM 3B
GUDIYAM 2
VADAMADURAI 2
PERCENTAGE
100
60
20
CHOPPER
CHOPPING
HANDAXE
CLEAVER
PEBBLE SC.
UNIFACE
BIFACE
SIDE SC.
POINT
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
M.

FIG. 3

The typo-technological observations in this case bases on the analysis of the following industries—Vadamadurai-2 and 3 Gudiyam 2, 3A and 3B; Vedullachervu; Anagwaddi; Nagarjunakonda-2 and Adamgarh.

VADAMADURAI

An intensive investigation was conducted in the valley of Kortalayar by K. D. Banerjee in the last decade. Vadamadurai, situated on the oldest terrace (TD) of the valley was also excavated by him (*IAR*, 1966-67). Among the three industries Vadamadurai-1, 2 and 3, we have found the last two suitable for the present study. All the three reported industries have been obtained from different stratigraphical horizons.

VADAMADURAI-2 was obtained from the second implementiferous layer, the 'detrital laterite'. It consists of five hundred and fifteen artefacts which are made on medium to fine grained quartzite pebbles. Though not much rolled, the artefacts are heavily patinated into various shades of red, as a result of contact with laterite of the region. The industry has been assigned to 'Early Acheulian' phase by the investigator.

Though dominated by handaxes made in Acheulean tradition, the industry also contains a considerable amount of chopper and chopping implements (cf. Table 1 and also Fig. 3). The ratio between handaxes made on cores and those on flakes is 3 : 1 and that of cleavers is 1 : 1. Most of the finished tools are converted from cores (5.9 : 1). Scrapers made on pebbles also form a good proportion of the finished tool group.

The total number of cores is limited (19), which form only 3.7% of the industry. They are divisible within seven technological groups. The dominant type being unprepared cores (31.5%). They have been worked out of roundish oval and irregular shaped pebbles. The biggest specimen of the group is 200×270×47 mm while the smallest 70×60×65 mm. Fourteen flake-scars have been noticed on them, their size-range being 100×79 to 55×60 mm. The flake-scars could be grouped into three, according to their shapes *i.e.*, long (6) round (5) and broad (3). Twenty-three flakes of this industry correspond with this group of cores. The size-average-mean of the flakes (87.8 mm) is slightly bigger than the size of the flake-scars on these (72.2 mm).

There are thirty-one flakes in the industry with unprepared dorsal surface and prepared striking platform but no corresponding core could be availed.

Core with preliminary preparation on dorsal surface and unprepared striking plateform comes next in the frequency to the former group (26.3%). Three cores are irregular and one each round and elongated. The size of the core ranges in between 200×135×80 mm and 57×60×37 mm. Six flakas have been detached from the five cores. They are of broad, round and elongated shapes. Their size-range is from 85×128 to 47×50 mm. It is interesting to note that the length-breadth-average mean of the six corresponding flakes with this group of cores (77.9 mm) matches well with the size of the flake-scars (77.5 mm) on these cores.

Cores with preliminary preparation on dorsal surface and prepared striking platform are only two (10.5%). One of them is long whereas the other is round. They measure 104×80×64 mm and 57×60×37 mm. Two elongated flakes one each from these have been datached. Nineteen flakes correspond with this group of cores. There is a difference of about 22 mm between the size-mean of the corresponding flakes (77.5 mm) and the flake-scars (55.2 mm) on the cores.

The three varieties of cores namely prepared core with unprepared striking platform, prepared core with prepared striking platform and Levallois core, are represented by one specimen each. In the case of the first type, a massive flake with faceted striking platform has been converted into a core. Eight flakes of the industry seem to be detached from this type of cores. The size-mean of the flake-scar is approximately 9 mm smaller than the size-average of the corresponding flakes (70.3 mm). One round flake has been detached from the broad Levallois core (86×95×58 mm). It is noteworthy that the measurement-mean (68.5 mm) of the six correeponding flakes tallies with the flake-scar (68×66 mm) on the core.

There are three bifacial discoidal cores forming 15.8% of the core group. They are oval and round specimens. In comparison to the aforesaid types, these are smaller *i.e.*, size-range being 60×72×52 to 46×50×40 mm. Though there are a few blades, no core of the type could be noticed by us in the collection.

The blanks form 36% of the industry. Seventeen flakes out of the total number of 185 fall within the undetermined type, due to the thorough working on their surfaces. Handaxes made on flakes number twelve and cleavers five. Besides, nine flakes also seem to be detached for the above mentioned types, but have been left unworked. Only thirty-five blanks have been converted into finished tools like scrapers, points etc. No Levallois point and blade has been converted into a finished tool. As per distribution of ratio between finished tools and simple blanks within the technological categories, it appears that the unprepared flakes required more reworking than the other types and, as we proceed towards technologically advanced types, the elaborate secondary working gradually diminishes and finally disappears.

Nine flakes of the industry which are comparatively bigger than the other flakes seem to be detached for making handaxes and cleavers but were left unworked. It seems noteworthy that two third of the cleaver-flakes and handaxe-flakes belong to unprepared and prepared flake groups.

The flakes of this industry are dominated by long flakes, followed by round, broad and oval specimens in that order. Irregular shaped flakes are seen in a very low proportion. In the group of Levallois flakes, oval shape dominates.

Blanks with unfaceted striking platform are predominant. Unprepared and faceted striking platform-types are almost in equal proportion. Levallois elements is present in 4.8% and the blades form 6% of the blank group (cf. Table 2). The occurrence of Levallois points is noteworthy. Mousterian technique of core preparation is also present in the form of bifacial discoidal cores.

All the above features taken together put the industry in a more developed stage than the one assumed by the investigator. The present industry shares a somewhat similar typo-technological features with industries of the group and can be assigned to atleast 'Middle Acheulian tradition.'

The three hundred and thirteen artefacts, constituting industry 3 are made on medium grained quartzite pebbles. The artefacts have light patination of yellow, brown and red colours. Techno-typologically as well as stratigraphically this industry appears more evolved than the former, according to the investigator. Fifty-five percent of the total industry is converted into finished tool group (173). There are only 7 cores (2.2%) and 195 blanks (62.3%).

It is primarily a flake industry, whereas the industry was dominated by implements made on cores.

The change can also be noticed in the case of finished tools. Various types of side-scrapers dominate this industry, followed by pebble-scrapers. In industry-2 handaxes were predominant, but now they occupy only a subordinate position. Compared to handaxes, cleavers are still in a lower percentage (1 : 6); chopper and chopping-tools form 17%, Tranchet are 4.6% of the finished tool group and blades with marginal retouching also appear in the industry (cf. Table 1 and also Fig. 2).

Only four types were noticed in the group of cores (7). There is only one core (75×62×50 mm) with preliminary preparation of the dorsal surface and unprepared striking platform. Two flakes—one elongated and the other round have been detached from it. Their size-mean (53 mm) is a little smaller than the size-mean of six corresponding flakes (58.3 mm).

There is a solitary example of the core showing preliminary preparation of the dorsal surface and unprepared striking platform. This elongated piece measures 75×62×50 mm. Two flakes, one elongated and the other round, have been detached from it. There is a difference of 5.3 mm between the measurement-mean of the two flake-scars (53.0 mm) and the six corresponding flakes (58.3 mm) found in the industry.

The next type has the same nature of the dorsal surface as the previous one but has prepared striking platform. The two specimens of this group are round and elongated and measure 68×65×55 and 105×80×64 mm. The measurement-mean of the forty-nine corresponding flakes is 53.7 mm which is about 22.3 mm smaller than the measurement-mean of the flake-scars (76.0 mm) appearing on the cores.

A majority of cores in the industry are with prepared dorsal and prepared striking platform. These are elongated, broad and oval shaped. Their size being 100×152×81; 60×55×49 and 255×145×126 mm. Five flakes have been detached from them. The size of the flake-scars tallies with the corresponding fifty-nine flakes of the industry (78.6 mm).

Though there are sixteen Levallois flakes in the industry not a single such core is noticed.

There is one bifacial discoidal core which is round and measures 46×50×40 mm. The percentage of blades has increased in this industry but the blade-core remains as yet unrepresented.

The blank group comprises 195 specimens forming 62.3%. All the technological-types are represented in this. The undetermined flakes as per Table 2 are in fact handaxe and cleaver flakes. Levallois element occurs in a higher percentage in comparison to the previous industry. Blades are 6.2% of the blank group and the Mousterian technique of flaking is also represented, although, by a solitary example of a bifacial discoidal core.

With the exception of the group of unprepared flakes the number of finished tools in all other cases is smaller than the unfinished blanks, the ratio ranging from 1 : 1.8 to as high as 1 : 11. In fact this seems to be the general trend of the industry as a whole. The proportion between the finished tools and unfinished blanks being only 1 : 4.05.

Six of the seven flakes seemingly detached for handaxes belong to the group of flakes with partially prepared dorsal surface and have 110.1 mm as their length-breadth average-mean. The remaining one (101.5 mm) is of prepared flake group. The measurement-mean of these specimens is nearly one and half times bigger than the flakes seemingly detached for smaller tools like scrapers. The measurement-mean of the former is 105.3 mm while it is only 63.9 mm in the case of the latter.

Except the groups of unprepared and Levallois flakes, in which case the oval shape occurs more frequently, all others show a definite preference for elongated flakes. The order of preference for the various shapes among the flakes is as follows : long, oval, broad and irregular (cf. Fig. 7).

The blanks with unfaceted striking platform, which incidentally also have the widest angle-mean, far outnumber the other three, while the blanks with unprepared and faceted striking platforms are in equal proportion (16.9%).

The above discussion on the two industries of Vadamadurai shows that they primarily differ from each other only on a couple of techno-typological grounds. Firstly, the industry-3 is dominated by various types of side-scrapers, while they form only 8.5% of the finished tool group in industry-2. Probably because of this feature, the former shows a higher proportion of flake implements than those made on cores. Handaxe, occupying predominating position in the industry-2, continues to be a major tool-type in the other as well. Pebble-tools (chopper and chopping-tools and scrapers on pebbles) are the other important tool-types of both the industries, although the percentage of the former is slightly higher in industry-2. On technological consideration, the only distinction is seen in the higher percentage of partially prepared flakes in industry-2 (29%) than in industry-3 (16%). The other types vary only marginally (less than 5%). This may lead us to suggest that the latter is a bit more advanced than the former industry, though basically following the same techno-typological tradition.

GUDIYAM

As mentioned in the preceding chapter three implementiferous localities have been reported by Banerjee near the village Gudiyam, in the vicinity of the river Kortalayar (see pp. 24 f). Locality-1 has revealed a post Acheulean industry (*IAR*, 1962-63 : 12). Locality-2 which is situated on the slope of a field has revealed two tool bearing deposits. The upper layer which is composed of loose brownish soil has yielded a mixed assemblage, according to the excavator, whereas, the underlying gravel contained industry belonging to the Lower Palaeolithic tradition (*IAR*, 1963-64 : 19). Locality-3 of the same site has yielded two industries 3A and 3B.

Gudiyam-2, industry comprises of seven hundred and eighty seven specimens, which are fine grained quartzite pebbles. They are devoid of rolling and are lightly patinated into various shades of brown and yellow.

The proportion of finished implements in the industry is not very promising, for they form 28.7% of the total. But if one excludes the total number of three-hundred and thirty-four waste-chips (42.4%) finished tools will form 52.5% of the main bulk of artefacts. Fifty-two specimens (6.6%) are classified under the group diverse. Handaxe and cleaver group made in Acheulean tradition is the characteristic feature of the industry. Besides, a considerable proportion of scraper on pebbles can also be seen (cf. Table-1) Biface (18%) and side-scraper (20%) are the other noteworthy implement-types. The finished tools made on cores dominate over those made on flakes, their proportion being 3.3 : 1. The ratio between handaxes made on cores and on flakes is 9.5 : 1 and that of cleavers is 1 : 1, 5.

The twenty cores of the industry form 4.8% of the total industry. Seven types are noticed within this group. The dominant type is unprepared core (6-30.3%). Specimens of this group are of round, oval and irregular shapes. Their size ranges from 255×70×118 to 75×70×75 mm. Ten flakes have been detached from the six cores. The measurement-mean of the ten comparable flakes of the industry is only 88.5 mm, while it is as much as 104.0 mm in the case of flake-scars on cores.

Though there were thirteen flakes with unprepared dorsal surface and prepared striking platform in the industry, no corresponding core was available.

There are two cores one oval and the other round in the class of core with preliminary preparation of the dorsal surface and unprepared striking platform. Their size is 200×175×75 and 250×230×150 mm. Two flakes have been detached from them. One is elongated and-other broad. The measurement the mean of the six corresponding flake is 107 mm which is a bit smaller than that of the flake-scars (113.2 mm) on these cores.

Among the group of three cores with preliminary preparation of the dorsal surface and prepared striking platform, two are round and the other elongated.

Their size range being 240×160×95 to 90×85×48 mm. Seven flakes of broad, long and round shapes have been detached from them. The measurement of the flake-scars range from 140×160 to 41×42 mm. The measurement-mean of the forty-two corresponding flakes is 86.9 mm, which is about 9 mm smaller than that of the flake-scars (95.7) mm.

Core with prepared dorsal surface are seven in number. Three of these have unprepared striking platforms while four are with prepared striking platform. The cores of the former type are elongated, round and irregular shaped, while in the latter group two cores are oval and one each broad and irregular· Their size range is 215×125×84 to 80×100×85 mm. One hundred and five flakes correspond to these cores. The measurement-mean of the flakes (95.5 mm) is bigger than flake-scars on these cores (77.5 mm).

There is one oval Levallois core (58×46×34) mm), from which one flake has been detached. The size of the flake-scar is in agreement with the corresponding flakes of this industry (60 mm). The blade core with one prepared striking platform has plano-convex striking platform. A split pebble or nodule has been converted into the core (98×45×40 mm). There are nine blades in the industry, which can be taken as corresponding to this core. However there is no Mousterian core.

The group of blank contains five hundred and fifty-seven specimens but two hundred and thirty-four are waste-chips. The proportion of the two being almost equal, 1 : 1. Waste-chips are excluded from the table and also from the Comparative analysis of the blank-types.

Levallois element is only 1.9%. The blades from 4.3% and there is also one blade core. Retouching on blanks is not very frequent and denticulated implements are almost negligible. Among the rest, prepared flakes are largest in number. It is interesting to note that the handaxe-flakes of the industry are bigger in size than those of cleavers *i.e.*, their size-mean being 129.3 and 118.7 mm, respectively. Besides, with the exception of unprepared group there is a gradual decrease in the size of the flakes. From flakes with unprepared dorsal and prepared striking platform and prepared dorsal and prepared striking platform to Levallois, the difference between the length-breadth average-mean of the two being as much as 44.6 mm. Elongated specimens are in a majority followed by broad, round, oval and irregular flakes. The blanks with unfaceted striking platforms far outnumber all the other types (cf. Table 3). It is to be noted that the faceted striking platform is not a characteristic feature of the industry.

The hundred and twenty-eight artefacts of Gudiyam-3A, come from the lower most implementiferous layer of the locality-3 and are made on quartzite pebbles. Finished tools form 61.5% (78); of the industry. The proportion of diverse increases in this 14.1%. Like the previous industry this also is characterised by implements made on core (ratio between the flake : core used for finished tools is 1 : 5). The characteristic tool-type, the handaxe and the cleaver are made in Acheulean tradition. Most of the handaxes are made on core and only a few on flakes (18 : 1). In contrast to it all the cleavers are made on flakes. The other noteworthy types are biface and pebble-scraper. Chopper and chopping-tools appear in this, while they were absent in the previous. The said types along with scraper on flakes are limited (5.4% each).

The seven cores of this industry form 5.5% of the total. Only three types of cores were observed in this industry. Two are unprepared cores which are made on irregular shaped pebbles. They measure 164×125×126 and 104×100×46 mm. One broad and one round flakes have been detached from these. There is a striking agreement between the size-mean of the only corresponding flake (77.0) with that of the flake-scars (76 mm). Cores with preliminary preparation of dorsal surface and prepared striking platform are three in number. Incidentally this is the most frequent type of core group (42.8%). These are elongated, broad and round, with the size-range 315×320×26 and 100×80×50 mm. Five flakes have been detached from the elongated and one each from broad and oval. The measurement range of the flake-scars is from 57×50 to 115×78 mm. The size-average of the four corresponding flakes is much bigger than the mentioned flake-scars.

Cores with prepared dorsal surface and prepared striking platform are only two (28.5%). The elongated specimen measure 135×104×103 and the other irregular 85×60×40 mm. Only one broad flake has been detached which is quite smaller than the seventeen corresponding flakes *i.e.*, size-mean of the former 72.5 and the later 100.5 mm.

Besides the aforesaid cores all the other types are unrepresented in the industry, though the flakes of the corresponding types are met with.

The group of thirty-seven flakes, form 29.1% of the total industry. No blade has been noticed in this industry (cf. Table 2). Seven comparatively massive flakes have been converted into finished handaxes and cleavers. Levallois element is 6.6% and is represented by the flake-group only as there is no classical Levallois core. Only one-sixth of the total number of flakes, is converted into finished implements. As was the case in the previous industry, elongated flakes dominate this industry as well followed by oval, irregular, and broad in that order. There is not a single round specimen (cf. Table 4). Similar to the other industry specimens with unfaceted striking platforms predominate this also. Unprepared striking platformed flakes are also quite frequent, but faceted striking platform is the least popular type (cf. Table 3).

Gudiyam-3B is stratigraphically as well as techno-typologically later than the previous one. The four fold classification of the total number of 140 implements of this industry is as follows: Finished implement—40 (26.6%); Core—13 (8.6%); Blank—93 (62.0%) and Diverse—10 (6.6%).

Sixteen specimens of the finished implement group are made on flakes, thus giving a ratio of 1 : 1.5 against the implements made on cores. The two cleavers are made on flakes whereas the ratio between handaxes made on cores and on flakes is 1 : 6. The most dominant implement-type of the industry is handaxe, which is made in Advance Acheulean tradition. Side-scrapers on flakes come next in the order, followed by bifaces and scrapers on pebbles respectively (cf. Table 1 and also Fig. 3) Cleavers and points are only 5% each of the finished tool group. Blade with marginal retouch which is absent in the previous industry, makes its appearance.

The thirteen specimens of the core groups are divisible within five technological groups. There is only one unprepared core (7.6%) which is irregular (100×97×34 mm). One elongated flake (68×40 mm) was detached from it, but no flake of the industry corresponds to this group of core. The second and third types of cores and their corresponding flakes are absent. There are two cores with preliminary preparation on the dorsal surface and prepared striking platform (15.4%). One of them is elongated (201×86×30 mm) and the other round (92×90×50 mm). One elongated and one oval flake have been detached from these two. Six flakes of the blank group correspond with this group of cores. Their length-breadth-mean roughly tallies with that of the flake-scars.

Preponderate core-type of the industry is core with prepared dorsal surface and prepared striking platform (30.8%). The cores of this category are oval, round, broad and irregular shaped. Their size-range being 135×104×103 to 85×60×40 mm. Three flakes have been detached from them. They are of elongated, oval and round shapes, and fall within the size-range 60×55 to 35×48 mm. There are six flakes which have 82.6 mm measurement-mean, and correspond with this group of cores. The only round Levallois core (130×116×58 mm) forms 7.8% of the core-group. Two flakes correspond with this core. Blade cores with single prepared striking platform form 30.7% of the total number of cores. These are pyramidal cores with a size-average 118×98×85 to 82×70×62 mm. There are as many as twenty-one blades in the industry, but it is difficult to determine whether all of them have been taken off from the type of cores under discussion.

Among the ninety-three blanks four are of undetermined type, because they have been converted into handaxes and cleavers. Flakes with unprepared dorsal surface are completely absent in the industry. Levallois flakes form 9.0% of the blank-group (cf. Table 2). There is also one Levallois point. Blades occur in very good percentage (23.1%). Though they were completely absent in the previous industry, they are present in Gudiyam-2. Retouching on blanks is not very common. Out of seven undetermined flakes two seem to be detached for handaxes and five for cleavers having 89.5 and 70.0 mm as their respective measurement-mean. They all belong to prepared flake group. The size range of the flakes is 49.5—73.2 mm with the representative group being 61.3 mm. Levallois point is the smallest specimen of the group, followed by Levallois flakes. The prepared flake-group contains the biggest specimens. Although the elongated flakes predominate as usual, the industry distinguishes itself by having a comparatively high proportion of oval flakes (cf. Fig. 7). Other shapes are also present in considerable proportion. The flakes of the industry when studied on the basis of the preparation of striking platform do not differ widely from each other either in relation to their size or angle of flaking. The prepared but unfaceted striking platform, as is evident, has been overwhelmingly preferred against the others (cf. Table 3).

The above discussed three industries of Gudiyam may be broadly divided into two, on techno-typological grounds. Gudiyam-2 and 3B can be assigned to group I and the remaining to the other group. On typological die the earlier group is dominated by handaxe, while side-scraper, biface and scraper on pebble are in the order of preference the other major tool-types. Chopper and chopping tools are absent. On technological consideration, the striking feature seems to be the presence of blades with unfaceted striking platform, though, appearing in different proportions in the two industries of this group. But atleast on one point the two industries of this group widely differ from each other. While there is a good percentage of flakes with unprepared dorsal surface in Gudiyam-2, this type appears only in a nominal proportion in Gudiyam-3B. In the present state of our knowledge, it is difficult to explain this important distinction.

Like previous group, handaxe is also the most preferred tool-type in the industry-3A of the second group, but the percentage of side-scrapers goes down considerably. Besides, the chopper and chopping-tools appear in a moderate proportion, though biface and pebble-scraper continue to be the important tool-type of this group also. Technologically the blades are altogether absent and nearly two third of the specimens of the blank group belong to the category of flakes with prepared dorsal surface.

It is interesting to recollect that the excavator also noticed two types of palaeolithic industries at Gudiyam (*IAR*, 1963-64 : 19). He calls one as Late

Acheulean and the other, belongs to a transitional stage between Late Acheulean and the Middle Palaeolithic. However, we are not certain about the nature of the specific typological category mentioned by him.

VEDULLACHERVU

Situated in the Reniguta subdivision of Chittoor district of Andhra Pradesh Veduallachervu has revealed both the Lower, Middle and Upper Palaeolithic industries. The Lower Palaeolithic implements come from the Gravel I. The two hundred and eighty-one artefacts studied by the present author are made on coarse to medium grained quartzite pebbles. These specimens show considerable transportation marks and have also thick crustation of yellow or brown patina. Finished tools number 192 and form 68.5% of the total collection. Though dominated by Acheulean implements *i.e.* handaxe and cleaver, the industry has a considerable proportion of chopper and chopping-tool. Pebble-scrapers and side-scraper on flakes are the other noteworthy types (cf. Table 1 and also Fig. 3). Most of the implements are made on cores (75.5% of the finished tool group). No handaxe or cleaver is made on flake.

The sixteen cores of the industry form 5.6% of the total. All these comprise four technological groups. There are two unprepared cores (12.5%). Roughly round pebbles have been used as cores. Twelve flakes correspond with this group of cores, their measurement-mean being 87.3 mm.

Though there are flakes of types II, III, IV, yet their corresponding cores are absent.

Core with prepared dorsal surface and unprepared striking platform also are in similar proportion as above (12.5%). One of them is elongated and the other roughly oval. No flake has been detached after the preparation of the cores. The corresponding eight flakes of this industry have measurement-mean of 87.0 mm. Cores with prepared dorsal surface and prepared striking platform preponderate (56.2%). There are three shapes, namely, elongated, oval and round, in this group, each of which is represented by three specimens. The size range of the cores is from 125×88×49 to 58×80×30 mm. A few flakes have been detached from them. Forty-nine flakes correspond with this group. Their measurement mean is 75.5 mm. The three Levallois cores form 18.7% of the core group. Two of them are oval and one round. Their size range is from 105×92×43 to 80×77×35 mm. The industry is devoid of Mousterian and Blade cores.

Blank group comprises one hundred and twenty specimens, forming 42.6% of the industry. Forty of these have been converted into finished tools, eight flakes seem to be detached for handaxe and cleaver but left unworked. Prepared flakes are far more numerous than the rest, and Levallois flakes and blades are 6.6% and 5.0% respectively (cf. Fig. 3). The tendency to retouch blanks and convert them into finished tools seems to be quite frequent in this industry (2.5 : 1 is the ratio between the finished tools and the simple blanks). Among the group of flakes seemingly detached for handaxes and cleavers, six are prepared and two are partially prepared The measurement average of these range from 117.5 to 123.5 mm with a general mean of 120.5 mm.

A distinguishing feature of the industry as per Table 4 appears to be the occurrence of broad flakes as a dominant group, followed by long, oval round and irregular ones in that order. In Levallois flake group, round shape seems to have prevalence, against the others. Table 3 indicates that the unfaceted striking platfrom is the most favoured type. It is to be noted that the blanks of this industry in general are comparatively small in size.

ANAGWADI

On the Ghataprabha river, this implementiferous locality was discovered by Pappu (1974 : 7) while he was surveying the Bijapur district of the Mysore State. The excavations of the cemented pebbly gravel, here, has revealed two-hundred and thirteen artefacts belonging to 'Early Stone Age' phase. The total collection made by Pappu constitutes five hundred and eighty-three specimens. This being a single-culture site, we unhestitatingly intend to study the total collection together. The studied material on which our observation bases comprises five hundred and seven artefacts. The remaining pieces do not evidence human workmanship according to our observations. The industry is made out of quartzite (94.51%), chert (2.06%), quartz (2.06%) and sand-stone (1.37%) lumps. The artefacts are almost fresh and do not evidence much transportation. They are patinated in red and orange colours.

The thirty six specimens classified under diverse by us form 23.4% of the total. Finished tools numbering three-hundred and ten form 53.8% of the total tool kit. Except for 23.2% of the finished tools which are made on flakes, the remaining ones are made on core. Handaxe is the most dominant type of tool, followed by chopping-tool, cleaver, biface, chopper and side-scraper, respectively (cf. Table 1 and also Fig. 3). Retouching of blanks does not seem to be a common practice, for only 5.1% blanks were converted into side scrapers.

Cores are present in very good proportion in this industry *i.e.* 128 (22.1%). All the types except cores for detaching blades are represented in this industry. The presence of Levallois and discoidal cores in such a good number (15.6% and 12.5%) is one of the main features of the industry. Their details are as lfolows :

Flakes have been detached from three massive irregular pebbles, without prior preparation of either the dorsal surface or the striking platform. The size-average of the flake-scars on these, roughly tallies with the size of the corresponding flakes.

There are only two (1.3%) cores with unprepared dorsal surface and prepared striking platform. Both of these are made out of flattish oval pebbles. The striking platform on these are worked at ends by high-angled working. No major flake has been detached from them, Three flakes of this industry correspond with this group of cores.

Pebbles with one flat surface have been converted into cores. The seven specimens contain little preparation and that, too, only on the dorsal surface. They are round (3), oval (2) and irregular (2) shaped. Only three flakes of the blank-group tally with these. The pebbles are converted into the next group of cores which are characterised by partially prepared dorsal surface and prepared striking platform (6.8%). Thirteen flakes of this industry correspond with this group of cores.

Cores with prepared dorsal but unprepared striking platform account for 21 specimens (13.5%). The following shapes have been noticed in this group of cores : elongated, broad, oval, round and irregular. Quite a few flakes have been detached from them and only seven flakes correspond with this group of cores. Prepondering type within this group of cores is that with prepared dorsal and prepared striking platform (31.2%). All the shapes are common in this group. In some cases final flakes have been detached after the preparation, but a few others do not show such marks. Forty-seven flakes of the industry seem to be detached from this type of cores.

In the group of Levallois cores (20; 15.6%) only round and oval shapes are noticed. Major flakes have also been taken off from some of them after preparation. Ten flakes of the industry correspond with this group of cores. The sixteen specimens of discoidal bifacial core group are either round or oval with thick biconvex cross-section. A rather unusual type consists of cores for detaching elongated flakes (9; 5.8%), has been noticed in this group. The pebbles have been thoroughly worked at one end and have broad or roughly round striking platforms. It is difficult to determine whether the surface from which the elongated flakes have been detached, was also prepared.

One hundred and thirty-six members of the blank-group form 39.7% of the industry. Seventy-three of these have been converted into finished tools. Among these, fifty-seven flakes are of undermined type (cf. Table 2), for they have been converted into handaxes (18) and cleavers (38) with thorough secondary working.

The remaining sixteen are side and angle scrapers. The occurrence of some Levallois points a rare feature of the Indian Palaeolithic phase along with a considerable proportion of Levallois flakes in this group, is of considerable significance (cf. Table 2). The industry is completely devoid of blade element. An attempt to achieve blade technology is evident from the nine cores prepared for detaching elongated flakes. This feature combined with the prepondering position of elongated flakes in the flake-group mark a typical technological feature of the industry. A subsidiary position is formed by round, broad and oval flakes, whereas, the occurrence of irregular flakes is negligible (cf. Table 4). Similar to the other Lower Palaeolithic industries unfaceted striking platformed flakes outnumber the faceted and unprepared types (cf. Table 3).

NAGARJUNAKONDA-2

This industry consists of two typologically similar tool kits coming from the surface of nearby localities of Nagarjunakonda valley. As evident from the comparative graph (Fig. 3), the industry is characterised by the Handaxe-cleaver group rather than the Cleaver group, which is the characteristic feature of the former industry of the valley *i.e.* NGK-1 (cf. Pant and Jayaswal, 1971). The four hundred and thirty-nine artefacts of the industry are made on medium grained quartzite pebbles. The group is slightly rolled and also lightly patinated.

There are thirty-one diverse forming 8.8% of the industry. Finished implements form 62.3% of the industry. Among the dominant tool-types mention may be made of scraper on split or naturally flat pebbles (pebble-scraper), handaxes, various types of side-scrapers and cleavers made on unprepared flakes also exist in the industry. Chopper and chopping tools are neglibible (cf. Table 1 and Fig. 3).

Cores are in a very low proportion (1.7%). Only three types are noticed within this group. Though there are unprepared flakes in the industry, there is no such core. There are two cores with partially prepared dorsal surface and unprepared striking platforms. One of them is broad (43×65×32 mm) and the other elongated (92×45×48 mm). Only two flakes have been detached from them, which are elongated (60×48 mm) and round (55×60 mm). Only one massive triangular flake corresponds with this group of cores. There is one broad prepared core which also has prepared striking platform. This specimen is smaller than the aforesaid (44×64×30 mm). Twenty-four flakes of the industry correspond with this type.

Discoidal bifacial core is most dominant type of the industry (50%). All these are roughly oval-shaped and have bi-convex cross-section. They do not vary appreciably in their respective sizes (range 80×90×40 to 80×80×35 mm).

A considerable part of the blank-group (117; 44.6%) has been converted into finished tools. The ratio between finished tools and unworked flakes being 1.7 : 1. There are only two Levallois flakes and three points. Unprepared flakes preponderate this industry. Besides, elongated and oval flakes prevail the flake group with highest frequencies. Broad flakes are also quite common, but round flakes are very limited in number. Flakes with unfaceted striking platform preponderate and are followed by unprepared striking platformed specimens. Only ten per cent specimens of this group have faceted striking platforms (cf. Table 3).

ADAMGARH

The excavations in the rock-shelter at Adamgarh, in the vicinity of the river Narmada has revealed both Lower and Middle Palaeolithic industries (Joshi, 1964). Two hundred and eighty 'Early Stone Age' implements were obtained from the layer composed of angular fragments and blocks of the local rock mixed up with local lateritic clay. The collection available to us for first hand study, comprises two hundred and sixty-five artefacts which do not contain any diverse. Most of them are finished-implements (80%) and have limited number of cores and flakes. It is basically a core industry, for the tools made on cores form 66.1% of the total, whereas those on flakes are only 33.9%. A few choppers and chopping-tools are also made of flakes. This is not a very common feature in the Indian sub-continent. Handaxes and cleavers made in Acheulean tradition characterise the industry. The proportion between handaxes made on cores and that on flakes is 2.4 : 1, but all the cleavers are made on flakes. Scrapers on pebble, chopper chopping-tool are the other noteworthy types (cf. Table 1 and also Fig. 3).

Unprepared core is absent from the group of cores (29), forming 11% of the industry. There is only one core with unprepared dorsal surface and prepared striking platform. Three flakes of the industry corresponds with this group of cores. A considerable proportion consists of cores with partially prepared dorsal and prepared striking platform (7; 24.1%). The preparation of striking platform on these have working angles 62°-84°. There is one broad core while the oval, round and irregular varieties are represented by two specimens each. The biggest specimen measures 85×75×75 and the smallest 50×50×31 mm. Two scars of 58×40 and 36×38 mm have been observed on these. Two flakes of the industry correspond with this group. Prepondering position is secured by the prepared cores (14; 48.2%). This feature also goes well with the flake group where the same technological group dominates. These specimens are round, oval, elongated and irregular shaped. However, there are at least sixty flakes which correspond with this core type. The round and oval specimens of the Levallois cores (7; 24.1%) are prepared in the classical manner. Their size range is from 95×85×62 to 52×51×48 mm. The size of the two flake-scars on two of them, roughly agrees with the size-mean of the corresponding flakes.

The blank group comprises ninety specimens and forms 33.9% of the industry. Twelve flakes have been converted into handaxes and cleavers and many more into side-scrapers, points etc. Prepared flakes with unfaceted striking platform far out number all the other types. Levallois flakes are also in good proportion (Fig. 3). Long and broad are the dominant shapes among various flake types, followed by oval and round (cf. Table 4). Irregular flakes are negligible. In the group of Levallois flakes broad flakes dominate. As many as five of the seven flakes of this type have been detached by the Victoria-West technique and were seemingly meant for cleavers. Besides, flakes with unfaceted striking platform preponderate (cf. Table 3). The method of preparing striking platform very carefully by removing small chips resulting in multiple facets was known, but not very frequently employed. Only three specimens have unprepared striking platforms and in case of 13.3% flakes, the nature of striking platform could not be determined.

The position of specialised tool-types within each industry correspond to the others, in general terms. Chopper and chopping-tools are absent in Gudiyam only. Their proportion in the remaining industries ranges 2-21%. The characteristic tool-type handaxe ranges from 22 to 47%, whereas the frequencies of cleavers fluctuate between 2.8 to 15.8%. Besides these, well known tool-types like scrapers made on pebble are also present in considerable proportion (15-27%) in all except Anagwadi where it is absent. Unifaces are absent in Gudiyam 3A and 3B. It's proportion in the remaining being 2 to 7%.

Inspite of the aforesaid general similarities, a closer examination of the typological characteristics of all the nine components of the Handaxe-cleaver group show a few deviations. Taking clues from the frequency histogram (Fig. 1), the nine industries have been separated within two on the basis of fluctuating percentage of major tool-types. This scrutiny was desirable for the comparative typo-technological analyses by means of cumulative curves. It would have been impossible to figure all the nine in a single illustration (cf. Fig. 3).

The five industries *i.e.* Vadamadurai-2, Gudiyam-2 and 3B, Vedullachervu and Adamgarh, can be sub-divided on the basis of the frequency variations of chopper, chopping-tool, handaxe and scraper on pebble. Close affinity is evident in case of Gudiyam 2 and 3B. These two lie a part from the other three curves,

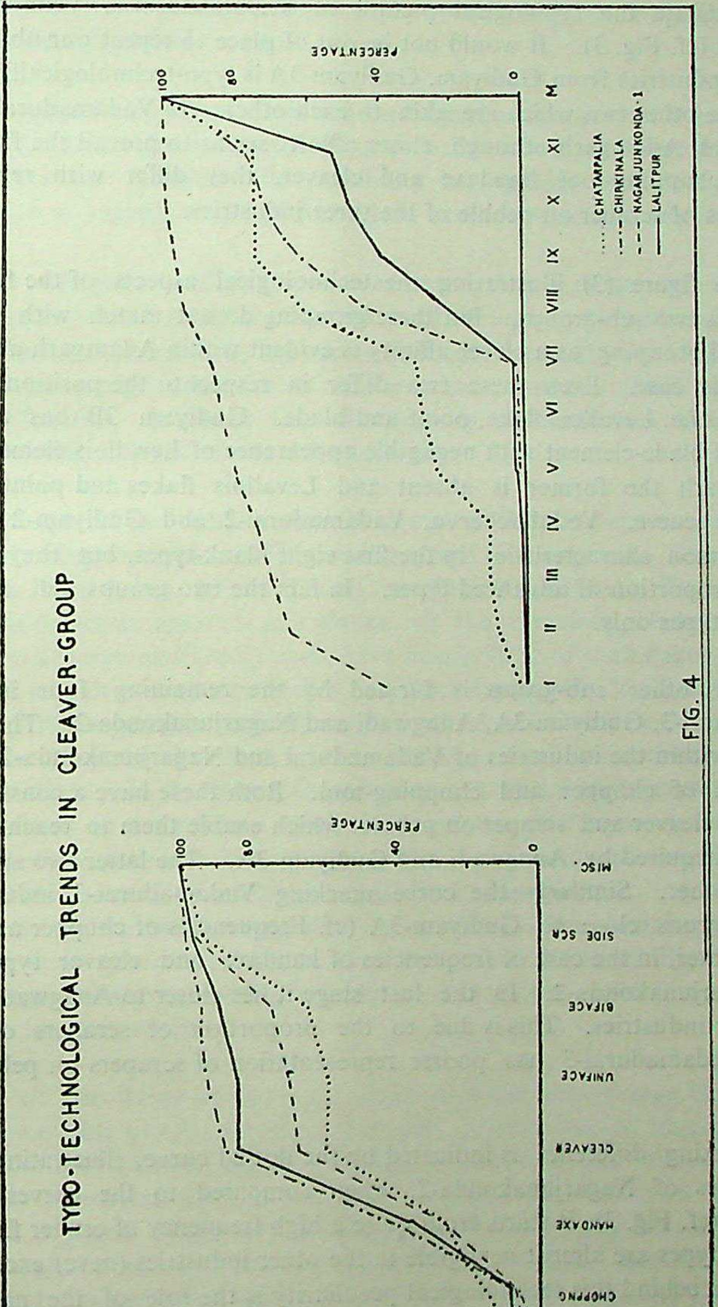

TYPO-TECHNOLOGICAL TRENDS IN CLEAVER-GROUP

FIG. 4

which indicate the typological picture of Vadamadurai-2, Vedullachervu and Adamgarh (cf. Fig. 3). It would not be out of place to repeat our observations on the three industries from Gudiyam. Gudiyam-3A is typo-technologically more evolved than the other two which are akin to each other. In Vadamadurai-2, Vedullachervu and Adamgarh, though closer affinity seems to prevail the frequencies of chopper, chopping-tool handaxe and cleaver, they differ with regard to the percentages of scraper on pebble of the three industries.

The figure (3) illustrating the technological aspects of the five industries also reveals two sub-groups. But these grouping do not match with that of the typological grouping, as a closer affinity is evident within Adamgarh and Gudiyam 3B, in this case. Even these two differ in respect to the position of advanced blank-types *i.e.* Levallois flake, point and blade. Gudiyam 3B has a good proportion of blade-element with negligible appearence of Levallois element. Whereas in Adamgarh the former is absent and Levallois flakes and points pushup the cumulative curve. Vedullachervu, Vadamadurai-2 and Gudiyam-2 have somewhat common characteristics in the first eight blank-types, but they too evidence varying proportion of advanced types. In fact the two groups fall apart in the first eight types only.

The other sub-group is formed by the remaining four industries *i.e.* Vadamadurai-3, Gudiyam-3A, Anagwadi and Nagarjunakonda-2. The noteworthy variation within the industries of Vadamadurai and Nagarjunakonda-2 is the lower proportion of chopper and chopping-tool. Both these have a considerable proportion of cleaver and scraper on pebbles which enable them to reach the similar position, acquired by Anagwadi and Gudiyam-3A. The latter two are quite close to eaeh other. Similarly the curve marking Vadamadurai-3 industry at it's beginning runs close to Gudiyam-3A (cf. Frequencies of chopper and chopping-tools). Later, in the case of frequencies of handaxe and cleaver types, it tallies with Nagarjunakonda-2. In the last stage it lies closer to Anagwadi rather than the former industries. This is due to the proportion of scrapers on flake and point. Vadamadurai-3 has poorer representation of scrapers on pebbles, uniface and biface.

Striking difference is indicated by the dotted curve, illustrating technological features of Nagarjunakonda-2, when compared to the curves of the other industries (cf. Fig. 3). It starts from quite a high frequency of cruder flakes, whereas the same types are almost negligible in the other industries (never exceeding 12%). The reason behind this technological peculiarity is the role of the nature of raw material in the Nagarjunakonda valley. It is pertinent to recall that a similar technological trend was noticed in Nagarjunakonda-1 (cf. Pant and Jayaswal, 1971). The rounded pebble surface was fully exploited by the palaeolithic man of the region. This feature has been discussed at the place where the Nagarjunakonda-1 has been discussed in detail.

In the absence of proper geo-chronological assignment of these industries it is difficult to handle the problem relating to the typo-technological differences within this group. However, the possibility of regional variation or cultural-groupings such as various stages of Acheulean can not be totally ruled out.

Before we pass to the discussion of next group, it is intended to highlight briefly the presence of scrapers on pebbles. This tool-type seems to characterise the group of handaxe-cleaver, by the consistent occurrence (15%—25%). To the best of our knowledge attention of the previous workers could not be drawn towards this features. It seems that the type is an important component of Acheulean cultural remains of the sub-continent.

The shape of the flakes within the group of Handaxe-cleaver when studied reveal the following features. Most popular shape is elongated. The frequency-range of the type being 25% (VDCH) to 59% (GDM-3A). Though a considerable variation seems apparent at a glance, all the remaining industries except for the Vedullachervu and Gudiyam-2, have nearly 40% of such flakes. The oval flakes are the next dominant type with a frequency-range of 11% (GDM-2) to 32% (NGK-II). With regard to the frequency of oval flakes Gudiyam-3B seems to be nearer to the Nagarjunakonda-2. The remaining six industries do not show any noticable variation. On the basis of the percentages of broad flakes three clusters could be marked in this group. The industries having a frequency-range of such flakes from 7—12% form the first group and the component of it are Gudiyam-3A and 3B. In the second, which is comprised by Vadamadurai-2, 3, Anagwadi and Nagarjunakonda-2, the percentage-range is 15—20%. The remaining industries forming the third group have more than 25% broad flakes (cf. Fig. 7). Round flakes are comparatively less. They occupy 8—18% of the collection. In case of Gudiyam-3A they are absent.

Most of the flakes of this group fall within the size-average of 60-89 mm. The size-range of this group is 30-59 to 209 mm. Flakes having size more than 159 mm have been grouped together, for the reason that such flakes are only few in some of the industries. Our comparative analysis also indicates that except for Gudiyam 3A and 2 all the remainining industries of Kortalayar valley and Adamgarh consist of quite a few small flakes (30—59 mm). Besides, specimens bigger than 119 mm are either absent or negligible in these. On the other hand in all the remaining industries, quite a few specimens of bigger size group are found. Gudiyam-3A and 2 industries contain some of the biggest specimens of the group. Besides, there is the evidence of Levallois flakes having bigger size than the other flake-types in them (Fig. 5). This fact comes out as one compares the size of Levallois flakes with the others in the industries of Anagwadi, Vadamadurai-2 and Gudiyam-3A. On the other hand in the industries Vadamadurai-3 and Nagarjunakonda-2 Levallois flakes are generally smaller than the other flake types. In the present state of our knowledge we are unable to explain the position.

CLEAVER-GROUP

Three among the selected industries form a typological-unit, which can be named as 'Cleaver group'. As the term implies, the prepondering position in this group is that of cleavers. The components of this typo-technological unit are Nagarjunakonda-1, Chirki-Nevasa and Lalitpur. It is interesting to note that even in the vicinity of these a similar trend is not to be seen. Thus, the other Lower Palaeolithic industry from Nagarjunakonda valley falls within the Handaxe-cleaver group. Similarly Nevasa has also yielded assemblage belonging to the handaxe-cleaver trend. The location of all these three in areas lying at quite a distance from each other mark them as isolated typo-technological unit. We give below the details of all the industries of this group.

NAGARJUNAKONDA-1

Nagarjunakonda-1 is the earliest industry of the valley. It comes from the lowermost pebbly-layer of the excavated trench at the north-western slope of the valley (*IAR*, 1959-60 : 5). The industry is made on coarse grained quartzite and is devoid of transportation marks. It consists of three-hundred and twenty-one artefacts and has been classified within four groups *viz.*, Finished implements 270 (84.1%), Cores 10 (3.1%), Blanks 242 (75.3%) and Diverses 13 (4.0%).

Finished tool group is dominated by cleavers (41.1%) followed by handaxes and various types of side scrapers (cf. Table 1). Cleavers are made on broad massive flakes detached from unprepared cores/boulders, thus, presenting a typical tool type of the industry (Pl. XVI, 1). The technique employed for the manufacture of these cleavers is an interesting feature of this assemblage. The cleaver-flakes have been detached from massive unprepared cores The projecting curvatures of the boulders, abundant in the area, have been utilised for controlling the shape of the flakes. In this case, there was no need for any extra preparation of the cores in order to get flakes with cleaver edges. A heavy blow at the centre of the base of the projecting natural curvature was sufficient to produce the desired flake, *i.e.* a broad flake with cleaver edge on one side. The flakes were then reworked on the sides to give them the final shape of cleavers. They fall within the range of 77.5 to 125.0 mm. They are in general bigger than such other flakes of the industry which were probably meant for manufacturing tools like scrapers, (cf. Fig. 4).

The ten cores of the industry fall within five technological groups and correspond with the size of the smaller group of flakes.

Two unprepared cores of irregular and oval shapes are bigger in size than most of the cores, measuring 200×120×108 mm and 180×100×98 mm. The size-range of the six flake-scars on these is 63×115 to 50×70 mm. The noteworthy feature is their size-mean which roughly tallies with the group of smaller unprepared flakes, but the proportion of the cores to that of the flakes in this is 1 : 7 which is quite low. But the most frequent type is core with partially prepared dorsal surface and prepared striking platform (40%). Two of them are oval and two broad. After a little preparation of the cores five flakes were detached from these. They are round, triangular, elongated and broad and lie between 60×81 to 53×68 mm size-range. The proportion of this type to the corresponding flakes is 1 : 4.8. There is only one prepared core with prepared striking platform. The roughly rounded core (130×110×66 mm) has been reworked after detaching a single massive flake. The biggest scar on the core is 78×57 mm. Nine flakes of the industry corresponds with this group. There is only one Levallois core and two Mousterian cores. The Levallois core is oval and measures 180×132×128 mm. The preparation-scars on it are of a size ranging from 65×50 to 87×87 mm size. These flakes correspond with this group of cores. However, the Mousterian cores are round and oval shaped, and are smaller in size *i.e.* 106×94×76 mm. and 95×75×50 mm.

Artefacts made on flakes are dominating in comparison to those made on cores. The flakes detached from unprepared cores or having very meagre preparation preponderate the industry. They far out number those flakes which have been taken off from thoroughly prepared cores. Levallois element though present is in a very low percentage. The by-products or waste-chips are also missing. Their absence may probably indicate that this locality was not a factory site. This assumption is further strengthened by the occurrence of a limited number of cores, which again do not represent all the blank-types present in the industry.

Flakes having unprepared striking platforms occupy a predominating position, followed by those with unfaceted and faceted striking platforms. The percentage of faceted striking platform is strikingly low. It is interesting to note that the flakes with unfaceted striking platform have the widest angle and the faceted ones the lowest.

Broad flakes are very common in the industry. Most of the cleavers are made on such flakes. This type is followed by oval, elongated, irregular and round flakes respectively.

On the basis of the size of flakes they are divisible within two groups (Fig. 5B). The massive ones which have been either converted into handaxes and

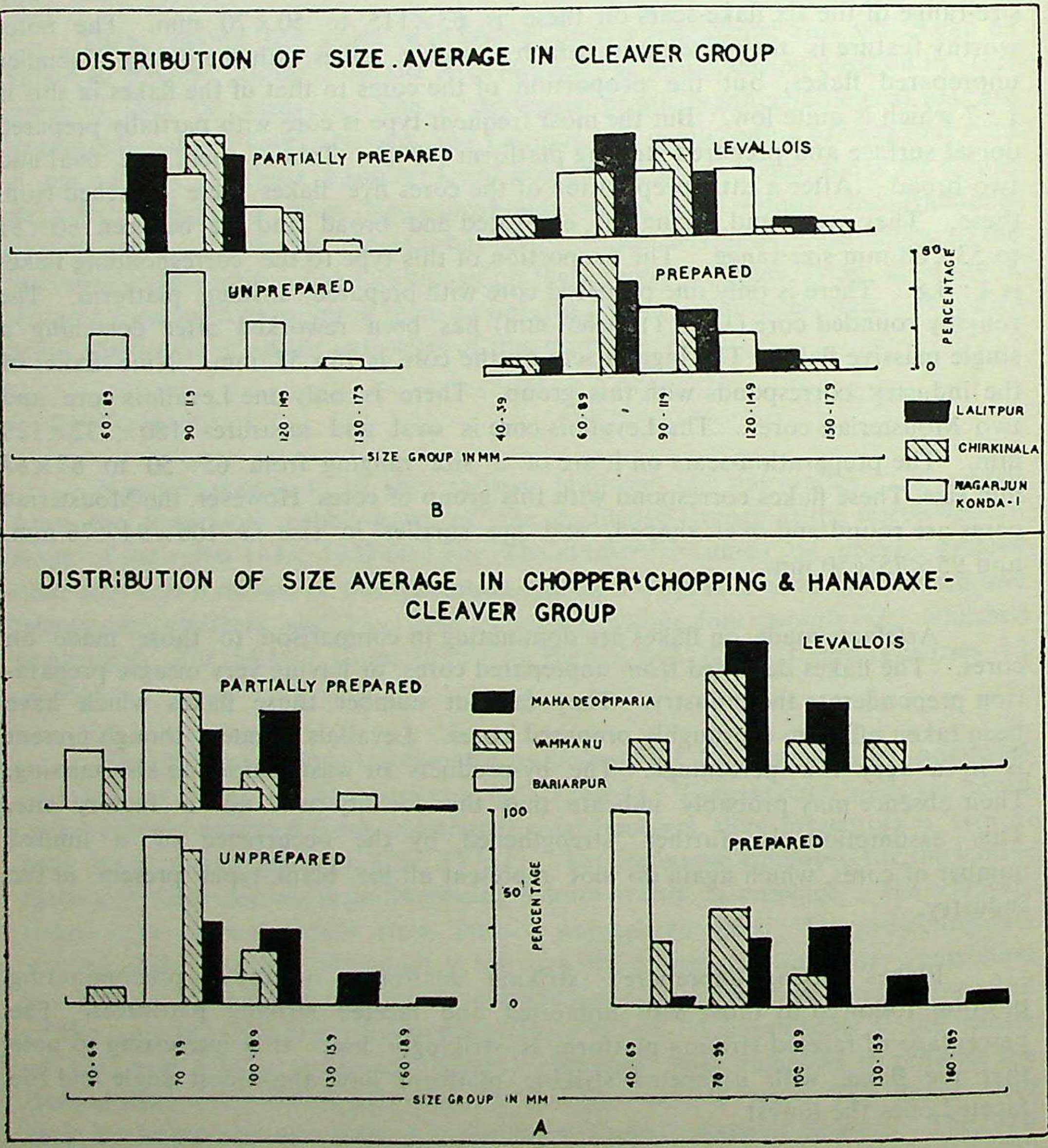


FIG. 5

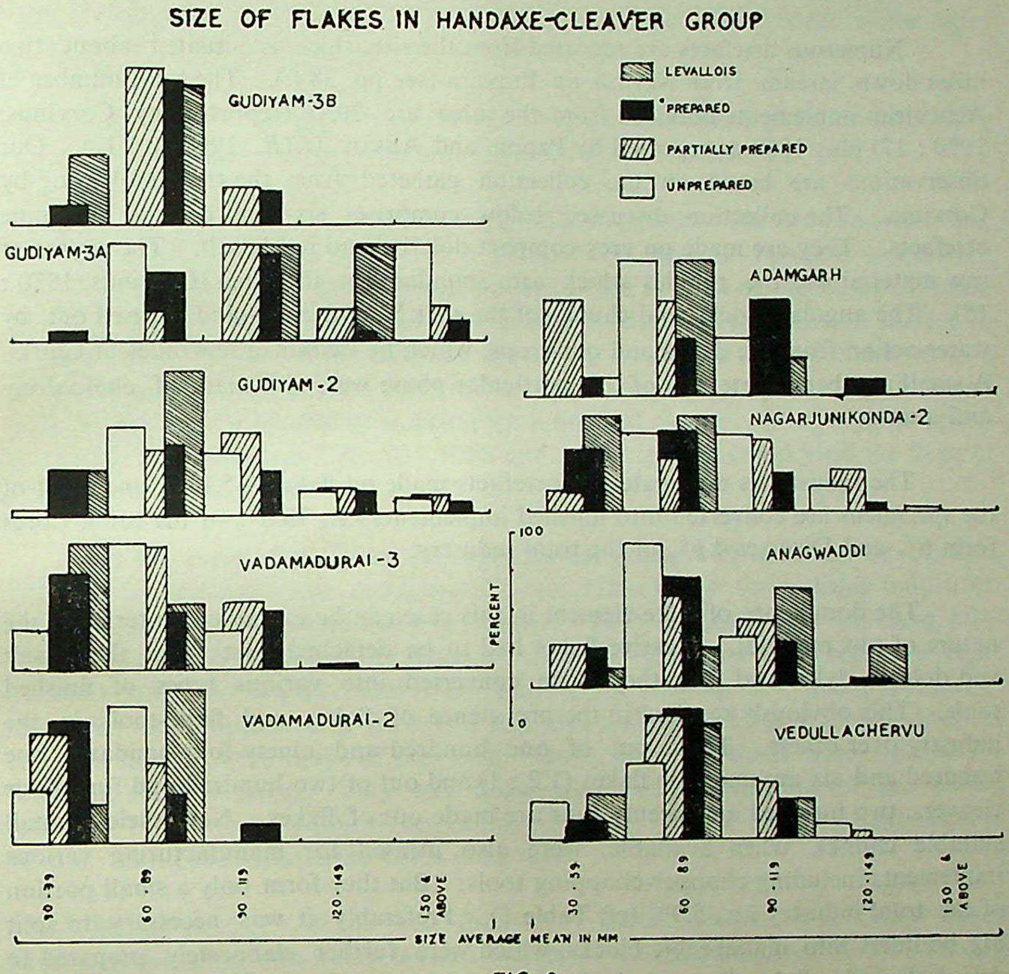


FIG. 6

cleavers or seem to be detached for making such implements are at least 40—60 mm bigger than the other group which consists of smaller flakes meant for other implements (cf. Fig. 5B). Cleaver made on massive unprepared broad flakes is the characteristic tool type of the industry.

They correspond with the first two types of Tixier (1963). Besides Nagarjunakonda, they are not found in any other Lower Palaeolithic industry of the sub-continent.

CHIRKI-NEVASA

Numerous artefacts are reported from the site which is situated about two miles down stream from Nevasa on Pravara (see pp. 38 f.). The total number of Acheulean implements obtained from the area are 2050 (reported by Corvinus, 1970 : 17) plus 1800 as reported by Pappu and Ansari (*IAR*, 1969-70 : 17). Our observations are based on the collection gathered from the trench VII, dug by Corvinus. The collection discussed below comprises six-hundred and fifty-nine artefacts. They are made on grey compact dolerite and red basalt. The source of raw material was the rubbles which are abundant in the area (Corvinus, 1970 : 15). The angular blocks and chunks of the rock were derived and carried out by water-action from the dykes and out-crops, which lie within a few miles of Chirki. A small number of artefacts of this particular phase were also made of chalcedony and quartz.

The industry is dominated by artefacts made on flakes (65.1%), and most of the specimens are converted into finished implements *i.e.*, 79.6% of the total. Cores form 6% and Diverses 4.6% of the total industry.

The dominance of flake-element in this case can be explained in terms of the nature of raw material. Massive flakes had to be detached first from the basalt and dolerite dykes and then they were converted into various types of finished tools. This obviously resulted in the prevalence of flakes and flake-tools in the industry over others. Thus, out of one hundred and ninety-four handaxes, one hundred and six are made on flakes (1.2 : 1) and out of two hundred and forty-four cleavers, two hundred and twenty four are made out of flakes. Nevertheless, small suitable chunks, when available, were also utilised for manufacturing various implements including chopper-chopping tools. But they form only a small portion of the total industry *i.e.*, 5.9% (cf. Table 1). Preferably it was necessary to split big boulders into manageable blocks, which were further elaborately prepared to detach desirable flakes for manufacturing cleavers and handaxes etc. The dominance of cleavers on flakes is one of the main characteristics of the industry and in this respect, it is comparable with the Lower Palaeolithic industries from Nagarjunakonda. But it needs to be emphasised that technologically both differ widely.

The number of cores are limited (40-60%) in the industry. There is a complete absence of unprepared, partially prepared and blade cores, which tallies well with the absence of the former flake types and also blade in the industry.

Cores with prepared dorsal surface and unprepared striking platform form 25% of the core group. Core with prepared dorsal and unprepared striking platform account for ten specimens. The cores are round, oval and irregular shaped. The size of the scar roughly tallies with the eight corresponding flakes of the type; their length-breadth average mean is 74 mm.

Cores with prepared dorsal surface and prepared striking platform form 50% of the group and are divisible within two, on the basis of their size.

(A) Massive cores were suitable for detaching flakes for working cleavers. They are eight in number. The big blocks were split in this case which were prepared on the sides. The upper and under surface in most of the cases is plain and flat. Thereafter a blow was applied near the edge on the flat split surface of the upper or lower part of the core for detaching a suitable broad flake with a sharp cleaver edge. The flakes from this type of cores are considerably big and required only a little secondary working for a finished cleaver. The biggest specimen of the type measures 250×225×218 mm. This in turn could yield the flake of a size-mean of 102.6 mm.

(B) The cores of the other sub-type number twelve and are smaller in size. This type is similar to those occurring in the other Lower Palaeolithic industries. They are of elongated, round and oval shapes. The final flake-scars on them tally with the size-mean of the smaller flakes of the type (55.0 mm). There are eight Levallois cores and two discoidal Mousterian cores, forming 20% and 2% respectively. All the Levallois cores are round and oval shaped with 80×76×40 mm to 62×57×36 mm as the range of their size. Only three of them were utilized for detaching the final flakes. This was done after the preparation of the dorsal surface. There are sixty-four flakes in the industry. Their measurement-mean is 60 mm. Both the Mousterian cores are round.

Blanks are 63.1% of the total industry. Three hundred and thirty flakes have been converted into handaxes and cleavers. The one hundred and six among them, which are converted into handaxes are of undetermined type. Besides, two hundred and twenty-four flakes are available in the form of cleavers. Among which thirty eight are of undetermined type. The blank types I, II, III, IV and VI are not found in the group of prepared and Levallois flakes of the industry. It is possible to subdivide each flake type within two, *i.e.* massive and small flakes. Massive flakes in both the types are more frequent than the small flakes. In the group of prepared flakes massive flakes are one hundred and eighty-two and the small fifty-nine only. Their size-average-mean is 102.6 and 57.5 mm, respectively. There are forty-two massive flakes against twenty-two small ones (105 and 60 mm as their size-average-mean). The other noteworthy feature is that the broad and cleaver shaped specimens fall invariably within the massive group, whereas, the group of small flakes are of various shapes. In general oval shaped flakes are

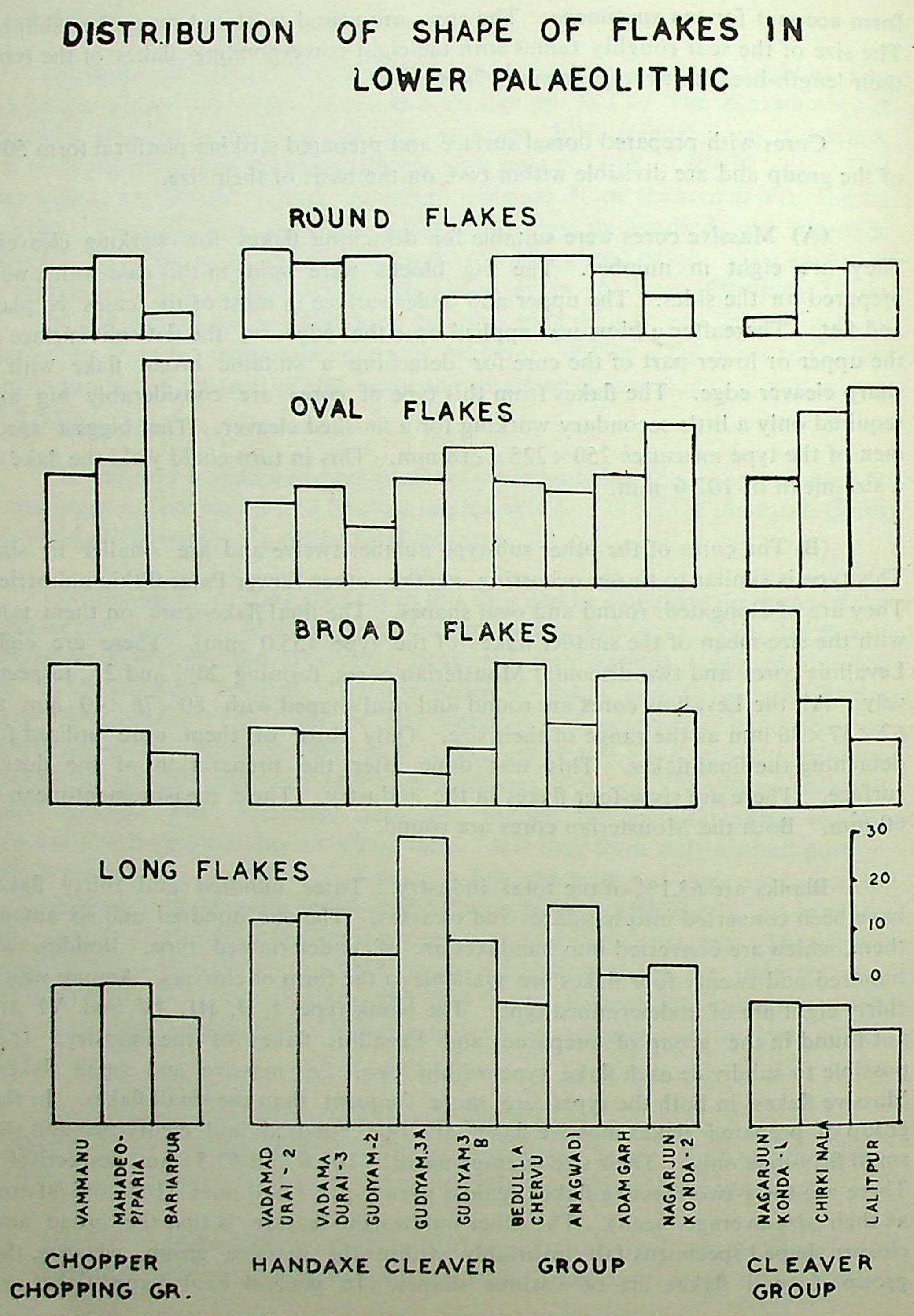

DISTRIBUTION OF SHAPE OF FLAKES IN LOWER PALAEOLITHIC
ROUND FLAKES
OVAL FLAKES
BROAD FLAKES
LONG FLAKES
30
20
10
0
VAMMANU
MAHADEO-PIPARIA
BARIARPUR
VADAMAD URAI - 2
VADAMA DURAI - 3
GUDIYAM - 2
GUDIYAM.3A
GUDIYAM3 B
BEDULLA CHERVU
ANAGWADI
ADAMGARH
NAGARJUN KONDA - 2
NAGARJUN KONDA - L
CHIRKI NALA
LALITPUR
CHOPPER CHOPPING GR.
HANDAXE CLEAVER GROUP
CLEAVER GROUP

FIG. 7

predominating the group of small flakes. They are followed by long broad and round flakes. Irregular flakes are negligible. Besides, flakes with unfaceted platforms are predominating. Though the unprepared striking platformed specimens are a few, flakes with faceted striking platforms are in considerably good proportion (19.1%). Most frequent type in this is unfaceted striking platform (46%). As mentioned before, blade element is completely absent.

LALITPUR

Situated in the district of Jhansi, Lalitpur is drained by Betwa system. It was believed to be an Acheulean openair factory site by Rameshwar Singh (1965). Subsequent work by Joshi reveals the fact that the implements are found in *debris* of the probable openair station (*IAR*, 1963-64 : 49-51).

The material under study comes from six small-scale diggings by Singh. The tool kit examined by the present author comprises six-hundred and six artefacts which are made on fine grained pinkish Bundelkhand grainite. Finished tools form 56.6% of the total, where as cores 8.3%, blanks 63.2% and diverses 5.5%.

A large number of finished tools are made on cores, the proportion between those made on cores and flakes being 1.06 : 1. Cleavers preponderate the industry followed by handaxes made in Acheulean tradition. The pebble-tool element, though present, is negligible. A few side-scrapers are seen but points and end-scrapers are conspicuous by their absence (cf. Table 1). Handaxes made on cores are more than those made on flakes (1.8 : 1), but cleavers on flakes are more frequent (1 : 17.6).

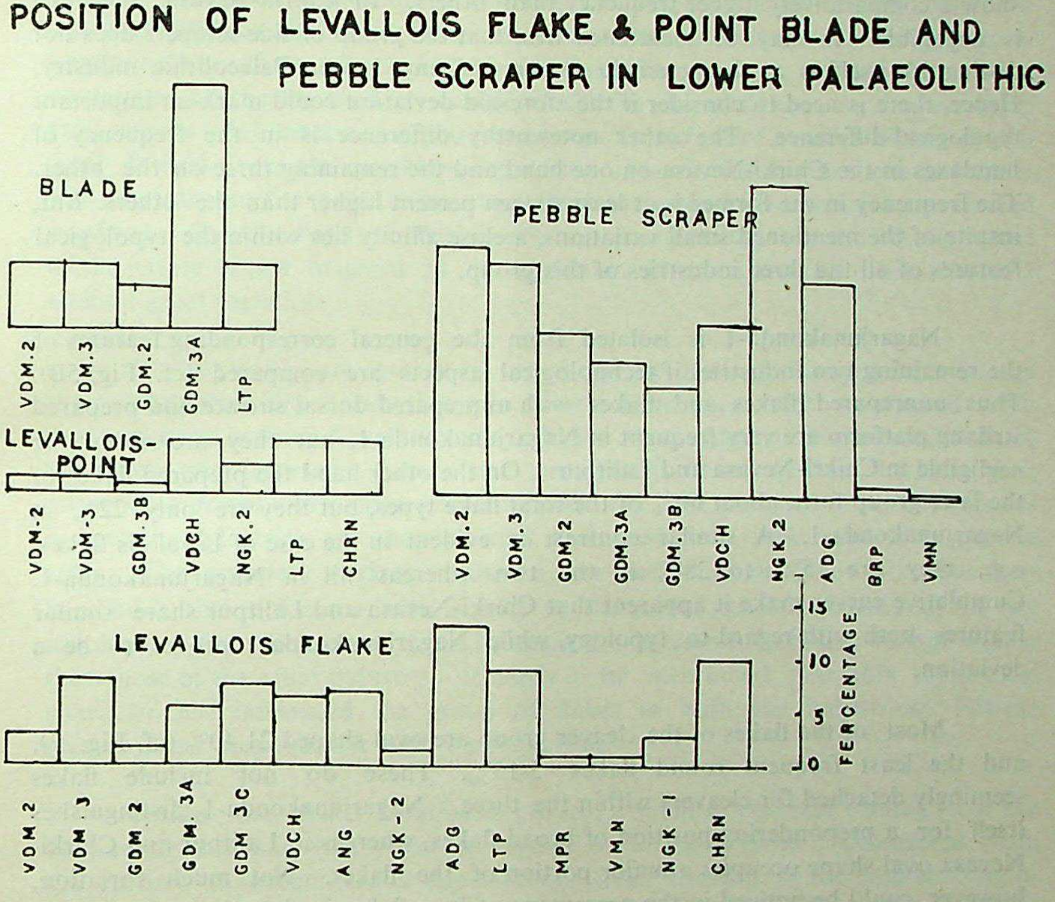
Since the industry comes from a factory-site, it is rather surprising to find a small number of cores (45 only). Their paucity cannot be explained at present.

Though there is one flake with unprepared dorsal, surface and unprepared striking platform, no such core was noticed in the industry. In contrast to this there is one flake with unprepared dorsal and prepared striking platform, but six cores of the similar type. Most of the cores of this group are irregular. But two have oval and elongated shapes. The size-range of these specimens is 190×130×80 to 150×100×40 mm. Cores with preliminary preparation of the dorsal surface but unprepared striking platform are also six. Five of them are elongated and only one is round. Their size range from 180×139×88 to 80×85×40 mm. Although a few flakes have been detached from them yet no,flake of the type has been noticed in the industry.

Cores with preliminary preparation of the dorsal and prepared striking platform are only two. They are broad and oval shaped and measure 180×199×40 and 120×100×38 mm. Only two flakes have been detached from them but there are four such flakes in the industry which correspond with this group of cores. Four different shapes have been noticed in the group of cores with prepared dorsal and unprepared striking platform (7). They are elongated, oval broad and round. The biggest specimen is 195×80×69 mm and the smallest 110×74×58 mm. Many elongated and few broad flakes seem to have been detached from them. Surprisingly no flake of the industry corresponds with this type of cores. Cores having similar dorsal surface as mentioned above but prepared striking platform is the most dominant type (26.6% of the group). The specimens of this group are elongated, round and oval, their measurement ranges from 115×78×50 to 215×180×90 mm. Many flakes have been detached from them and a good number of flakes seems to correspond with these. Levallois cores are only round and oval shaped. They are also smaller than the above types as their size range between 99×86×40 and 80×79×50 mm. This type is matched with forty-four specimens of the flake group. The smallest specimens of the core-group belong to Mousterian core (6) *i.e.* 70×68×45 mm to 52×51×30 mm. All of these are round. It is interesting to note that a few flakes of the industry under discussion are even bigger in size as compared to the Levallois cores. Such flakes are massive and no corresponding core has been obtained. Although we have a few blades yet not a single blade-core has been observed.

In the group of blanks sixty-four specimens (15.6%) are waste-products. This group has been excluded from the frequency table of blank-type (Table 2). Besides, as many as one hundred and thirty-six flakes have been classified under the group of undetermined flakes for they have been thoroughly reworked and converted into handaxes and cleavers. Thirty-six flakes are comparatively bigger in size and seem to be detached for cleavers (30) and handaxes (6), but have not been re-worked. Thirteen specimens have also been converted into side-scrapers.

Technologically the industry seems to be highly developed. Levallois element is present in considerably good proportion 15.5%. As in the other industries, prepared flakes occupy a dominating position in this industry also and all the cruder types are very limited (cf. Table 2). Levallois points are comparatively rare in the Indian Palaeolithic industries and this is one of the few industry where it is present. The Mousterian and blade detaching techniques were also used by the makers of this industry. The angle variation of the flakes is not much. Oval flakes preponderate the flake-group followed by elongated round and broad. It is probably due to the massive flake group that the oval shape is very common in the industry. There is only one specimen with unprepared striking platform and if we leave aside the undetermined group, unfaceted striking platformed blanks far out number those which have faceted striking platform.



POSITION OF LEVALLOIS FLAKE & POINT BLADE AND PEBBLE SCRAPER IN LOWER PALAEOLITHIC

FIG. 8

Typological comparison of the three industries reveals that the cleaver element in this case range between 54.5% and 60.7%, whereas the handaxes are only 30.6% to 42.0%. The proportion of chopper-chopping element is considerably low *i.e.* 2.2% to 8.7%. Scrapers made on core/pebble are completely absent. Thus, on general typological considerations all the three reveal closeness (cf. Fig. 4) The flake element prevailing in Lalitpur and Chirki-Nevasa is almost in equal proportion 63.2 and 65%, whereas it is a little higher in Nagarjunakonda-1 *viz.*, 75.3%.

Inspite of the typological similarities within the three, a few minor variations are easily noticeable (Fig.4). For example side-scrapers on flakes in Nagarjunakonda-1 show a comparatively higher frequency than others. In Chirki-Nevasa, the type is negligible. It may be mentioned here that the group of side-scrapers does not distinguish itself as a characteristic feature of any Lower Palaeolithic industry, Hence, there is need to consider if the aforesaid deviation could mark an important typological difference. The other noteworthy difference is in the frequency of handaxes in the Chirki-Nevasa on one hand and the remaining three on the other. The frequency in the former is at least sixteen percent higher than the others. But, inspite of the mentioned small variations, a close affinity lies within the typological features of all the three industries of this group.

Nagarjunakonda-1 is isolated from the general corresponding features of the remaining two industries if technological aspects are compared (cf. Fig. 5B). Thus unprepared flakes and flakes with unprepared dorsal surface and prepared striking platform are very frequent in Nagarjunakonda-1, but they are absent or negligible in Chikri-Nevasa and Lalitpur. On the other hand the prepared flakes of the later group form about 60% of the total flake types, but they are only 22% in Nagarjunakonda-1. A similar contrast is evident in the case of Levallois flakes, *e.g.*, they are 15% to 28% in the two whereas nil in Nagarjunakonda-1. Cumulative curves make it apparent that Chirki-Nevasa and Lalitpur share similar features both with regard to typology, while Nagarjunakonda-1 proves to be a deviation.

Most of the flakes of the cleaver group are oval shaped 21.40% (cf. Fig. 7), and the least frequent round flakes 5-15%. These do not include flakes seemingly detached for cleavers within the three. Nagarjunakonda-1 distinguishes itself for a prepondering position of broad flakes, whereas in Lalitpur and Chirki-Nevasa oval shape occupies a major portion of the flakes. Not much variation, however, could be noticed in the percentage of long-flakes in the three.

An attempt is made to reveal as well as to compare the distribution pattern of size-average of flakes within the cleaver dominant unit (cf. Fig.5B). The representative size groups in all the three industries are 60-89 and 90-119 mm. In Nagarjunakonda-1 one-third of the Levallois flakes seem to be bigger than Chirki-Nevasa and Lalitpur specimens. Levallois flakes of Chirki-Nevasa are as a rule larger than those of Lalitpur *i.e.* most frequent group in the former is 90-119 mm, whereas in Lalitpur 60-89 mm.

The technological variation in the cleaver group depends on the nature of available raw material. The stones used for the three industries are of three different types, *i.e.*, Basalt and dolerite was used in Chirki-Nevasa, Bundelkhand grainite for Lalitpur and quartzite for Nagarjunakoda-1. Besides, the surface of these also varies and this has a relevance to the subject matter under discussion.

Basalt, dolerite and Bundelkhand grainite was acquired from nearby dykes or outcrops whereas big boulders were available to the prehistoric man in Nagarjunakonda valley. Consequently, in Nagarjunakonda the man utilised the natural curvatures of the big boulders to achieve cleaver shaped flakes. In the remaining two, raw material contained angular and irregular surface of massive blocks which were derived from the neighbouring dykes. It is evident that in the latter case it was necessary for the manufacturer to prepare these blocks for securing the desired products. On the basis of this observation, it is possible to postulate the factor of the nature of raw material as an important phenomenon for this aforesaid technological variation.

A few words are necessary for the group of cleaver-shaped flakes of the three industries. The cleaver-flakes in Chirki-Nevasa are either detached from prepared cores or from Levallois cores. In the other industry (Nagarjunakonda-1) the same were obtained either from unprepared flakes or from the flakes with unprepared dorsal and prepared striking platform. At the same time, such flakes in both the industries are mostly broad and need very little reworking on the sides. The secondary working on them are at medium angle (50°—70°). But there is considerable difference with regard to the size of the cleaver-flakes of the two industries. The specimens of Chirki-Nevasa are on the whole nearly 40 mm smaller than those of the other industry. It needs to be mentioned that this typological character has influenced the group of flakes in both the industries. For the cleaver-flakes preponderate both the industries.

Besides the above mentioned groups, a small assemblage coming from the Potwar region is noteworthy, for it reveals a different trend. Discovered from the earliest implementiferous deposits *i.e.* from the top of the boulder conglomerate of terrace TD, these were obtained from six different localities *viz.*, Alakpur, Adial, Chauntra, Kallar, Chaumukh and Jammu. Only eight specimens could be collected. Six out of these are massive unprepared flakes having unprepared dorsal surface, big and plain striking platform seen at an obtuse angle to the ventral surface (100°—125°). No sign of reworking on the edges has been noticed. The remaining two are pebble-tools of 'unilateral nucleate or Soan type 6 (Paterson and Drummond, 1962 : 58, Fig. 17, 6). This type is comparable to pebble-scraper of our classification. The assemblage was named 'PRE-SOAN' by De Terra and Paterson (1939) and was interpreted as 'Clactonian intrusion' by Paterson and Drummond, 1962 : 58-59). The existence of this group as a raminiscent of different culture-group has at times been doubted (Oakley, 1957 : 199-209 and also Misra 1965 : 10). In case its existence is confirmed by future investigations, it might form fifth typo-technological group within the Lower Palaeolithic culture-complex of the sub-continent.

The technological trends within the three discussed groups—(i) Chopper-chopping, (ii) Handaxe-cleaver and (iii) Cleaver, when compared in detail easily distinguishes the group (i) by a distinct tendency namely the presence of unprepared flakes in good proportion, which is very low in the third group (except Nagarjunakonda-1 and one of the industries of Handaxe-cleaver group *i.e.*, that reveals similar trend). The industries 1 and 2 from Nagarjunakonda tally with Chopper-chopping and Handaxe-cleaver group with regard to the various flake types. But the presence of cleaver shaped broad flakes is a special feature of Nagarjunakonda-1.

The position of advanced flake-detaching techniques, in the Lower Palaeolithic industries of this sub-continent has been presented in the form of frequency histograms. Blade element is present in Lalitpur industry, but do not exceed 10% (cf. Fig. 8.). Levallois point, a rare-feature in this phase was noticed only in two industries—*i.e.* Vadamadurai-2 and Lalitpur (Fig.8), but in these two, it does not go beyond 2%. The proportion of the flakes detached by Levallois technique varies from 0—22% (cf. Fig. 8.).

The presence of Levallois element in the Lower Palaeolithic phase of this sub-continent is akin to the other parts of the world, specially Europe. However it's origin and evolutionary stages could not be recognised here, so far, with certainty.

Most of the industries of the Peninsula are akin to Middle Acheulean tradition of European Lower Palaeolithic Culture. The special mention in this case is our Handaxe-Cleaver group. A few industries like Gudiyam-3A and 3B may reveal Advanced Acheulean trends if compared from European material, in detail. The relationship among all the four mentioned trends, observed in the Lower Palaeolithic phase of this sub-continent is unknown. The claims of a gradual development of Chopper-Chopping element into Handaxe-Cleaver element at Madeo-Piparia, by Khatri, (1963) and recent work by Wakankar at Bhimbetka (1973), are controvertial issues. Similarly, the position of Chopper-chopping and Handaxe-Cleaver groups is unassertable. It might be fruitful to investigate, whether it tallies with 'Abbevilleo-Acheulian' or 'Early Acheulean' traditions, recognised outside this sub-continent. The present position reveals the existence of Chopper-Chopping group in isolated pockets in the Peninsula and are concentrated in the Extra-Peninsula. The second group Chopper-chopping and Handaxe-cleaver, is scarce and scattered here and there. Thereafter, one meets with the abundent material of 'Handaxe-cleaver' group. The strong preference for manufacturing cleavers at a few localities is another noteworthy feature. It might also be helpful to investigate the suggestion made by Joshi (1972), for the possible use of cleaver, *i.e.* the interpretation is in terms of meeting a particular ecological need by this specialised implement.

The development of Lower Palaeolithic Cultures in Europe and Africa, undergo two different ways. In Africa the Abbevillian stage developed into Early Acheulean through a number of stages. Whereas in Europe, the remains of Abbevillian is very limited and the Early Acheulean stage is also not very well represented. In contrast to this the development from Middle Acheulean to Advance and Late Acheulean has been come forth in definite geo-chronology. In the present state of our research we are at loss to achieve any such conclusions. Hence, the problems related with the origin and development of the Lower Palaeolithic Cultural traits of this sub-continent needs serious concentration of workers, equipped with new methods.

TABLE

FINISHED TOOLS IN THE LOWER

S. No.	Tool-types	Indus					
		VDM-2	VDM-3	GDM-2	GDM-3A	GDM-3B	VDCH
1.	Chopper	18	5	0	5	0	11
2.	Chopping-tool	72	20	0	5	0	19
3.	Handaxe	81	30	76	36	14	55
4.	Cleaver	10	5	12	4	2	12
5.	Scraper on pebbles	78	38	32	10	4	31
6.	Side-scraper	31	42	45	5	9	37
7.	Angle-scraper	0	3	0	0	0	6
8.	Biface	0	0	41	10	6	9
9.	Discoids	0	0	4	0	0	2
10.	End-scraper	2	0	0	0	0	1
11.	Point	8	7	4	0	0	2
12.	Blade with marginal retouch	0	1	3	0	1	0
13.	Polyhydral	9	10	3	2	2	0
14.	Uniface	19	10	6	0	0	4
15.	Tranchet	14	8	0	0	0	0
16.	Pounder	0	1	0	1	2	0
	GRAND TOTAL	342	180	226	78	40	189

1

PALAEOLITHIC INDUSTRIES

tries

ANG	VMN	NGK-1	NGK-2	CHRN	MPR	ADG	BRP	LTP	TOTAL
27	10	9	2	3	23	15	12	7	147
64	23	7	7	28	89	22	46	14	416
104	21	57	72	194	16	55	15	93	919
49	6	111	29	244	12	18	5	138	657
35	1	13	78	0	0	43	2	0	365
13	17	56	39	15	83	20	10	103	435
3	3	8	4	8	12	4	0	0	51
11	7	7	16	9	1	21	0	19	157
4	2	0	0	0	0	0	0	0	12
0	1	0	0	0	0	0	0	0	4
0	0	3	6	0	4	3	3	0	40
0	0	0	0	0	1	0	0	0	6
0	0	0	0	0	0	0	0	0	26
0	6	0	21	25	4	11	2	23	131
0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	4
310	97	271	274	526	245	212	95	307	3392

TABLE

BLANK-TYPES IN LOWER

S. No.	Blank-types	Indus					
		VDM-2	VDM-3	GDM-2	GDM-3A	GDM-3B	VDCH
1.	Unprepared fl.	23	12	10	1	0	12
2.	Unpre. dor. unfac. st. pl.	22	7	28	0	0	8
3.	Unpre. dor. fac. st. pl.	9	4	3	1	0	3
4.	Part. pre. dor. unpre. st. pl.	6	7	0	2	1	8
5.	Part. pre. dor. unfac. st. pl.	13	49	6	4	5	16
6.	Part. pre. dor. fac. st. pl.	6	14	41	0	1	2
7.	Prepared dor. unpre. st. pl.	8	0	1	3	7	8
8.	Prepared dor. unfac. st. pl.	45	40	17	15	42	33
9.	Prepared dor. fac. st. pl.	16	19	77	2	4	16
10.	Levellois fl. unfac. st. pl.	3	9	11	2	6	7
11.	Levallois fl. fac. st. pl.	3	7	4	0	1	1
12.	Levallois point	3	3	0	0	1	0
13.	Blade unfac. st. pl.	10	10	9	0	2	6
14.	Blade fac. st. pl.	1	2	0	0	0	0
15.	Undetermined fl.	17	12	16	7	4	0
	GRAND TOTAL	185	195	223	37	93	120

2

PALAEOLITHIC INDUSTRIES

tries									
VMN	ANG	NGK-1	NGK-2	CHRN	MPR	ADG	BRP	LTP	TOTAL
19	3	96	41	0	71	3	4	1	296
13	3	56	14	0	75	3	2	1	232
3	0	13	5	0	25	0	1	0	67
4	0	8	1	0	16	0	3	0	56
12	3	15	15	5	59	2	5	4	213
0	6	7	2	0	9	0	0	0	88
3	0	9	4	8	45	0	0	0	96
7	7	25	26	160	140	45	2	61	665
7	32	10	4	79	50	13	1	58	388
4	15	3	1	47	6	8	0	30	152
2	9	0	1	17	0	4	0	14	63
1	1	0	3	0	0	0	0	6	18
0	0	0	0	0	9	0	0	8	73
0	0	0	0	0	0	0	0	0	3
0	57	0	0	144	12	12	7	136	424
75	136	242	117	460	517	90	25	319	2834

TABLE 3

NATURE OF STRIKING PLATFORM IN LOWER PALAEOLITHIC INDUSTRIES

Industries	Nature of Striking Platform							
	Unprepared		Unfaceted		Faceted		Undetermined	
	No.	%*	No.	%	No.	%	No.	%
Vadamadurai-2	37	20.0	93	50.2	35	19.0	20	10.8
Vadamadurai-3	33	16.9	117	60.0	33	16.9	12	6.2
Gudiyam-2	38	16.0	153	69.6	16	7.2	16	7.2
Gudiyam-3A	6	16.2	21	57.0	3	8.1	7	19.0
Gudiyam-3B	8	9.0	74	82.8	7	7.4	4	4.5
Vedullachervu	24	20.0	74	61.7	22	18.3	0	0
Vadamanu	26	34.6	24	32.0	24	32.0	1	1.3
Anagwadi	14	10.2	50	36.5	16	11.7	56	41.5
Nagarjunakonda-1	113	46.9	106	43.8	20	8.3	3	1.0
Nagarjunakonda-2	46	39.3	59	50.4	12	10.0	0	0
Chirki-Nevasa	8	2.0	212	46.0	96	19.1	144	32.8
Mahadeo-Piparia	132	27.5	247	51.5	89	18.5	12	2.5
Adamgarh	3	3.3	58	64.4	17	18.9	12	13.3
Bariarpur	7	28.0	9	36.0	2	8.0	7	28.0
Lalitpur	1	3	107	33.5	75	23.5	136	42.6

*Percentages mentioned in the table are worked against the total number of blanks of individual industries.

TABLE 4

SHAPE OF FLAKES IN LOWER PALAEOLITHIC INDUSTRIES

S. No.	Industries	Shapes					Total
		Long	Broad	Oval	Round	Irreg.	
1.	Bariarpur	4	2	8	1	3	18
2.	Mahadeo-Piparia	127	79	110	83	64	463
3.	Vadamanu	16	17	12	8	4	57
4.	Vadamadurai-2	61	24	25	27	8	145
5.	Vadamadurai-3	73	25	34	26	10	168
6.	Gudiyam-2	62	47	22	28	20	179
7.	Gudiyam-3A	16	2	6	0	3	27
8.	Gudiyam-3B	23	7	17	5	8	60
9.	Vedallachervu	27	32	23	17	10	109
10.	Avagwadi	36	14	15	13	2	80
11.	Nagarjunakonda-2	37	27	36	7	6	113
12.	Adamgarh	24	21	18	10	5	78
13.	Nagarjunkonda-1	61	91	54	14	22	242
14.	Chirki-Nevasa	23	21	33	13	3	93
15.	Lalitpur	30	24	68	29	18	169
	TOTAL	620	433	481	281	186	2001
	PERCENTAGE	31%	21.6%	24.5%	14.5%	8.3%	

CHAPTER IV

The Middle Palaeolithic

Following the initial recognition at Nevasa (Sankalia, 1961), numerous Middle Palaeolithic sites have been located in the different parts of the sub-continent. Its stratigraphical position is also now well established. It belongs to 'Gravel II' or the finer gravel which overlies 'Gravel I', consisting of Lower Palaeolithic tools (Sankalia, 1975). As no stratigraphic division within gravel II itself is possible, the tool types recovered from this gravel cannot be further sub-divided on a stratigraphic basis. It has, therefore, to be conceded that stratigraphic basis for the study of Middle Palaeolithic phase stands no comparison to the situation in Europe, where changes in tool types can be studied in direct correlation with their stratigraphic position. Hence, through techno-typological analysis, we intend to find out regional variations or evolutionary stages, if any, within the Middle Palaeolithic complex. The previous attempts in this direction (Rao, 1968 and Jayaswal, 1974), however, were not of much avail.

The habitational-locales of this phase, as in the case of Lower Palaeolithic, have been brought to light from nearly every part of the Peninsula and the extra-Peninsula (cf. Sankalia, 1975). The industries of the Peninsula are believed to constitute a single culture-group, known as 'Nevasian' after the type site Nevasa. There is another group which is confined to the North-western part of the sub-continent, and is said to be an extension of the earlier Soan culture. All the selected industries are located within the boundaries of the Peninsula and before commencing the actual analyses of the same, it is proposed to mention the Potwar group in brief. This account is based primarily on the published accounts of De Terra and Paterson (1939) and Paterson and Drummond (1962).

A number of small assemblages from the Potwar region can be assigned to the Middle Palaeolithic phase, as they all belong to the earlier part of the Upper Pleistocene period. These assemblages seem to constitute three typological groups. The first is formed by the 'Late Soan' assemblages of De Terra and Paterson (1939) and 'Upper Soan', 'Evolved Soan' and 'Final Soan' of Paterson and Drummond

(1962). Though there is definite evidence for the advancement within these assemblages with regard to the technological aspects, they seem to retain the basic typological features, as for instance pebble-tools of Soan types continue to dominate in this phase as well. The second group is formed by the assemblages of 'Upper Clacton A and B', which represent the developed form of the earlier Clactonian tradition. Pebble-tools are completely absent in these and instead of flakes detached by Clactonian technique, most of them were obtained by Levallois technique in the Upper Clactonian A and B groups. According to the investigators, this group is comparable to Mousterian facies of Europe (Paterson and Drummond, 1962 : 92). In case of the third group, earlier 'Stellenbosch' assemblages are seen as evolving into 'Upper Stellenbosch'. Handaxe tradition in this group is accompanied by advanced techniques of detaching flakes (Paterson and Drummond, 1962 : 93-95).

Besides the existence of the three said groups, there also seem to exist a few cultural-off-shoots in the region. These were the results of mixing up of two different cultural groups such as 'Upper Soan Stellenbosch', and 'Upper Acheulian Clactonian'. As is evident from the illustrations and also the account of these assemblages, they all seem to have close technological affinities among themselves (cf. Paterson and Drummond, 1962). All of them contain a good proportion of Levallois and Mousterian techniques. Thus, it is apparent that the investigators have separated these cultural units, primarily on the presence or absence of pebble-tools and/or handaxe elements. The total number of implements collected from individual sites, in the region are so small that this criterion cannot be relied upon.

The group of Peninsular India is represented by hundreds of industries, coming from almost every part of the area. Amidst this numerous collections,twelve industries were found suitable for a statistical study. They come from—Vadamanu, Nandipalle, Vedullachervu, Anagwadi, Kovalli, Tamkur, Nagarjunakonda-3, Mahadeo-Piparia, Adamgarh, Luni, Ramgarhwa and Jamalpur sites. A typological account of each of these is being mentioned below.

VADAMANU

A rich Lower Palaeolithic collection was made from this site but only eighty-seven specimens could be obtained during the excavations of Gravel II at Vadamanu, in Cuddapah district of Andhra (Reddy, 1968 and also *IAR*, 1964-65 : 2). The artefacts are made on fine grained quartzite which is locally available in the form of nodules, chunks, and water-borne pebbles (Reddy, 1968 : 131). The artefacts are also devoid of transportation marks. Blanks were first detached from these chunks or nodules and were, thereafter, converted into finished implements. Quite a few flake of this group were also left unretouched as the proportion of blanks to cores is 25.6 : 1, whereas, the ratio between the implements made on cores and those on blanks is as low as 1 : 3.4.

Table 5, makes it clear that the typology of this industry is characterised by various types of side-scrapers and pointed implements. Among the group of scrapers, high angle working is a rare feature, as there is only one round-scraper and no end-scraper in the industry. Chopper and chopping-tool types occupy a considerable part of finished implements (*i.e.* 25.8%). It will be worthwhile to remember that the same implement types preponderate the earlier industry from the site. The handaxe tradition of the earlier industry is totally replaced in the present, by various types of scrapers.

There are only three cores which form 2.5% of the industry. Only two types are found in this group. There is one core with unprepared dorsal surface and prepared striking platform and two with prepared dorsal and prepared striking platforms. The former is an oval specimen and the latter two irregular and elongated. All the other technological types , are represented by blank group, but do not find their counterparts in this group.

The total number of blanks in this group is seventy-seven. Two comparatively massive and thick flakes have been converted into choppers and due to the thorough secondary working are of undermined type. The blank group is dominated by prepared flakes (52%), which are followed by partially prepared and Levallois flakes (22.5% and 12%). The position of both the types—unprepared flakes (3.9%) and the blades (2.6%) is meek. Levallois points are not present.

Depending on the nature of preparation of the striking platform the blanks here have been divided into three types (cf. Table 7). The second type which consists of prepared but unfaceted striking platforms, is dominating the blank group of this industry. Careful preparation of the platform, which results in faceting the surface, is noticed in the case of 30.6% blanks. The blanks having unprepared striking platform are the biggest in size (their size mean being 52.7 mm) and those of unfaceted, the smallest (43.3 mm). The angle between the striking platform and the flake surface of the three types of blanks shows the following variation, *i.e.*, 103° of unprepared and faceted platformed specimens and 111.6° of the unfaceted.

The flakes are of five different shapes, *i.e.*, oval, elongated, broad, round and irregular (Table 8). Their frequency proportions within this industry are 4.3: 2.6 : 1.8 : 1, in the respective order. Oval flakes are in dominating position in partially prepared and Levallois group of flakes. This is one of the reason why oval flakes do dominate the centre flake group of the industry (Fig. 12).

As per figure it is clear that the representative size-group of this industry is 40-59 mm, as most of the specimens fall within this group. However, the size range of the flakes of this industry is 41.0 to 63.3 mm with the size-mean of 49.5 mm.

NANDIPALLE

On the banks of the river Saligeru, near the village Nandipalle two implementiferous localities were noticed by Reddy (*IAR*, 1964-65 : 2; Reddy, 1968 : 35).

The industry consists of sixty-seven artefacts only. Similar to the above industry, it is also made on fine grained quartzite, and the artefacts are devoid of rolling. The industry also consists of only one diverse.

In the finished tool group though handaxe element exists (5.2%), it is the various types of side-scrapers which have prepondering position. For, single side-scrapers form 26.3% and double-side-scraper 15.7% of the finished tools. Points also occupy a good position (26.3%). The other types present are scrapers on core, round scraper and blade with marginal retouch (cf. Table 5).

Only four cores were noticed in the industry. They are of unprepared and Levallois types.

Unprepared cores are of oval and round shapes. A few elongated flakes have been detached from them. The size of the flake-scars roughly tallies with the corresponding flakes of the industry.

The shapes oval and round have been observed in the group of Levallois cores (2). No flake has been detached from them after the preparation of both the surfaces.

The industry under discussion is primarily a flake industry. For, the proportion between the artefacts made on cores and those on blanks is 1 : 8.4. Among the finished tools, all except three are made out of blanks (ratio between core and blank tools=1 : 6.3).

The blank group is dominated by prepared flakes, followed by the Levallois (16.5%) and the partially prepared (11.4%) flakes (cf. Table 6 also Fig. 10). Unprepared flakes and blades are nominal (3.5% each).

Among the blanks those with unfaceted striking platform dominate (79.6%), followed by the third and first types, respectively (cf. Table 7 also Fig. 11). The flakes with faceted striking platform have the angle-mean of 111.0°, but the mean of their length-breadth average (46.3 mm) is more than the other types. The specimens of the first group are the smallest (38.7 mm) with the widest angles *i.e.* mean of the angle being 115°.

The oval shaped flakes are dominating the blank group, followed by round, elongated, broad and irregular flakes (cf. Fig. 12). Their respective proportions are 8 : 4 : 3.3 : 2.6 : 1. Whereas, the oval flakes predominate in the prepared flake group and round flakes are more frequent in the Levallois group.

ANAGWADI

The artefacts coming from the second gravel at Anagwadi are made of chert and quartzite. The tools on chert nodules are more rolled than those on quartzite. The total number of ninety-four artefacts are divisible within three broad categories. These are, finished tools—twenty-nine (30.8%), blanks—eighty-two (87.2%) and cores—eight (8.5%). The typo-technological features revealed by these are mentioned in the following lines.

Except four, two handaxes and one each biface and scraper on core, all the other finished implements are converted from blanks. Corresponding to the general trend of the Middle Palaeolithic industries, the present one is also dominated by various types of side-scrapers on flake (cf. Fig. 9). Points and blades with marginal retouching are in equal proportion, *i e.*, 6.9% each (cf. Table 5). The notched tendency of retouching is quite frequent. There is also a considerable percentage of implements with high angle retouching (13.8%). The presence of handaxe indicate the survival of an earlier tradition. However, the implements of the industry under discussion are comparatively smaller than those present in the former industry.

Within the group of cores there is not a single unprepared core, though eight such flakes were noticed in the industry. The three types present in this group consist of specimen with prepared dorsal surface and prepared striking platform, Levallois cores and Discoidal bifacial core of Mousterian technique. Not a single flake has been detached from this elongated prepared core. It measures 78×70×40 mm. Thirty-three flakes of the industry correspond with this group of core. The second type, *i.e.*, Levallois cores preponderate the group of core. The five specimens for this type form 62.5% of the group. All are round cores. Their size ranges between 30×58×27 and 80×85×40 mm. The proportion of the cores to the corresponding flakes is 1 : 3. The third type is represented by two specimens. Both are round and comparatively smaller than the above mentioned types.

The number of cores is quite insufficient. Besides, all the technological groupings represented by the blank-types is not always found in this group. For example no unprepared core has been noticed in the industry though there are eight such flakes. But according to the available data it is apparent that Levallois technique was very common along with Mousterian technique.

In the group of blanks, prepared flakes are dominating (37.5%), followed by Levallois flake (18.3%), partially prepared, flake, flake with unprepared dorsal and prepared striking platform, respectively. There are only five blades in the industry. Most of the blanks have prepared unfaceted striking platform (65.8%). Specimens with faceted striking platform (20.7%) seem to be more common than this in the unprepared platforms (13.4%). Blanks with unprepared striking platforms have the widest angle (109.5°) and those with faceted striking platform the lowest (103.3°). But the biggest flakes fall within the group of faceted striking platformed specimens (54.0 mm) and the smallest in that of unfaceted striking platformed ones (51.6 mm as their size average mean). The range of the size-average of the flakes is 43.0 to 67.0 mm.

Most of the flakes are elongated, followed by round, oval, irregular and broad flakes in that order (cf. Table 8). It is interesting to note that elongated shape is the commonest type in the group of Levallois flakes while the round shape is commonest in that of prepared flakes. It will be seen that our typo-technological observations differ considerably from those of the investigators (Pappu, 1974).

VEDULLACHERVU

The Middle Palaeolithic industry from the site was obtained from the gravel-II, and are made on medium to fine grained quartzite (Murty, 1966). Among the total number of three-hundred and forty-eight implements twenty-one are 'waste-products'. The remaining artefacts fall within four categories, *i.e.*, finished tools—140—42.8%, cores—26, 7.9%, blanks 204—62.4% and diverses—29—8.9%.

It is apparent from the Table 5 and also Figure 9 that the handaxe-cleaver tradition still preponderates. However, the artefacts belonging to the Middle Palaeolithic phase are better made than those belonging to the earlier industry from the site. Scraper on flakes are the next frequent type. Retouching on flakes is not very common in the industry. The proportion of notched implements and those having high angle retouch is very low. Burin and points are almost negligible with considerable proportion of blades with marginal retouch (cf. Table 5). Most of the implements are made on blanks (the ratio between core : blank being 1 : 7.8).

Only three types of cores were noticed in the industry. All these exhibit advanced technological features. A small part of the industry is formed by unprepared and partially prepared flakes but corresponding cores could not be noticed.

The nine cores with prepared dorsal and prepared striking platform form 34.6%. Most of the cores are irregular shaped. Levallois cores are of three different shapes—round (5), oval (5) and elongated (3). The largest core of the group measures 82×64×32 mm and the smallest 37×35×24 mm. The size of the flakes detached from these cores seems to correspond with the available flakes of the types (45 mm). The proportion of the cores and flakes is 1 : 4.1.

All the four specimens of Discoidal bifacial core group are round. Their size ranges between 30×21×20 and 60×58×30 mm. There are a few blades in the industry but no blade core has been noticed in the industry.

The total number of two hundred and four blanks make them the dominating category of the industry (62.4%). Thirty-seven flakes have been converted into handaxes and cleavers and thirty-nine into various types of other finished implements. The proportion between the simple blanks and finished tools works to 1 : 2.7. All the fifteen types are noticed in the group. The high frequencies are obtained by prepared flakes with unfaceted and faceted platforms, Levallois flakes and blades. The proportion of Levallois point is also noticeable (cf. Table 6).

Flakes with unfaceted striking platforms are dominating (51.2%) followed by unprepared and faceted striking platforms (cf. Table 7). The absence of blades with micro-platform indicates that the authors of this industry were unaware of the punch-technique. Flakes with faceted platform have lowest angle-mean and unprepared the widest, *i.e.*, 109.5° and 112.6°, respectively.

The oval flakes, consisting of forty-nine specimens, dominate the flake group and is followed by elongated, round, broad and irregular flakes respectively (cf. Table 7). The size average of the flakes of this industry ranges from—39.4 to 59.2 mm.

KOVALLI

Kovalli industry was obtained from the vicinity of the village of the same name by Pappu (1966 : 94). The implementiferous locality is situated at a distance of sixteen kilometres north-west of the famous Middle Palaeolithic site Bagalkot. At Kovalli, the Pleistocene deposition is on the banks of the river Ghataprabha. At a distance of six kilometres from the alluvial composition, an openair factory-site has yielded rich artefact-cluster (Pappu, 1966 : 197). Being a single culture site and also yielding a considerable number of artefacts, the industry obtained from the said factory-site has been selected for detailed examination. In his account, the investigator has mentioned two thousand four hundred and twenty-nine artefacts, among which, he himself admits that 1535 specimens are waste-products (Pappu, 1966 : 197). The collection available to the present author at Deccan College Poona contained three hundred and three artefacts only. It is apparent that the waste-products along with a few others are unaccountable. The following observations are based on the excavated material made available to us for the first hand study.

The raw material used for manufacturing the tools of the phase is yellowish chert. The broad categories prevailing the industry are of finished tool 104 (34.3%); core—15 (4.9%); blank—136 (44.8%) and unclassified—108 (31.8%) groups. Details of the first three groups are as follows.

Finished tools made on blanks are only a little more than those made on core (1 : 1.3). Side-scraper is the most dominant type. The peculiar feature in the industry is that the side-scrapers are generally made on flattish nodules, instead of flakes, which is the common practice in Middle Palaeolithic industries. In the case of the artefacts made on flake double side-scraper dominates and is followed by side-scraper made on flake, angle-scraper and end-scraper, respectively (cf. Table 6). Small bifacial tools also appear in a good percentage (cf. Fig. 9). Besides quite a number of implements are notched.

Cores are in the ratio of 1 : 9 to the blanks of the industry. Besides, all the type corresponding the blanks are not available. Thus, there are unprepared flakes in the industry but no such cores could be noticed. Five types have been noticed in the group of cores. There are two cores (13.3%) with unprepared dorsal and prepared striking platform (Type II). Both of these are irregular shaped. They measure 70×40×50 and 67×39×20 mm. Only two flakes have been removed from these, the size of flake-scars roughly correspond to the similar flakes of the industry. The proportion of the cores of this group and the flake-scars on them to the corresponding flake group of the industry is 1 : 7.

There are six specimens in the group of cores with prepared dorsal and prepared striking platform (Type IV) which form 40% of the core group. Elongated cores are dominating this group of cores followed by round oval and irregular shaped specimens, respectively. Two of these, after detaching flakes, have been converted into scrapers. Five flakes have been detached from them. The ratio between the cores of this group and corresponding flakes is 1 : 9.8.

Both the specimens of the Levallois core group are round and measure 50×55×30 and 40×38×24 mm. Only one flake has been detached after the complete preparation of one of them. The flake-scar is also round with 20×18 mm as its measurement. The flake is just half the size of the parent core. Fourteen flakes correspond with this group.

All the three discoidal bifacial cores (20.0%) are round and their size range is 40×45×30 and 36×34×24 mm.

There are two blade cores, while only nine blades were noticed in the industry. The cores have one striking platform at one of the ends and it is elongated in shape. The surface opposite the dorsal, is unworked and flat.

The total number of blanks is 136, from which sixty have been converted into finished tools (1 : 2.2). Twenty-eight others are partially retouched. As per Table 6, blank-types III and XII are unrepresented in this industry. Forty-nine percent of the specimens are detached from prepared cores, whereas about ten by the application of Levallois technique. Blades form 6.5% of the group. In most of the blanks striking platform has been prepared by removing a single chip. Blanks with faceted striking platform are more numerous than those with unprepared striking platforms (cf. Table 7).

Elongated flakes are, in general, dominating the flake group, followed by round, broad, oval and irregular flakes in that order (cf. Table 8). In the group of prepared flakes, the elongated ones dominate, whereas round flakes are more frequent in Levallois flake group. The size of the flakes of this group lies in between 43.2 and 60.0 mm length-breadth average range.

TAMAKUR

The investigations in the Shorapur district (pp. 6 f.) by Paddaya reveals that inspite of excavated material available more appropriate for the present study is a surface collection from Tamakur. For mixed collections are reported from the other localities (Paddaya, 1968).

The total number of one hundred and fifty-two artefacts of this collection are made of chalcedony, chert, jasper, quartzite and agate nodules, in the above order of frequency. We are informed by the investigator that all these are locally available in the region (Paddaya, 1968). The artefacts are heavily patinated.

In comparison to the previous industries, this one has very low proportion of finished implements, *i.e.*, thirty-seven forming 24.3%. The five diverse form 3.2% of the total collection.

Except one, all the finished implements are made on blanks, giving a ratio of 1 : 36 between the finished tools made on core and blank. The exception is a chopper which is made on a nodule. The dominance of various types of side-scrapers mark typological feature in this also (cf. Table 5). Double side-scrapers and tranversal-scraper types are also quite frequent, *i.e.*, 26.5% and 13.5% respectively. Points and end-scrapers are also comparatively more in this industry than the others (cf. Table 5 also Fig. 9). The single small chopping-tool of the industry may also be regarded as massive scraper on a core.

The group of cores, comprising twenty-five specimens form 16.4% of the total industry. Cores are present in quite a good number and represent nearly all the types. Unprepared cores dominate the group (10-40%), while there are only nine corresponding specimens in the blank-group. This type consists of long, oval and round cores. Their size range is from 86×86×50 mm to 40×43×34 mm. The other types are as follows:

Cores with unprepared dorsal surface, but prepared striking platform number four (16%). All these are round. Their size ranges between 80×68×50 and 60×50×33 mm. Only two flakes have been detached from two cores. The size mean for seven corresponding flakes is 62.8 mm.

There is only one core with partially prepared dorsal surface but unprepared striking platform. The only specimen of the group is actually a thick flake, which has been converted into a core after a little preparation of dorsal surface. Two elongated flakes have been detached from it. The measurement-mean of the five corresponding flakes is 51.5 mm.

Cores with prepared dorsal surface and prepared striking platform account for five specimens forming 20% of the group. Two elongated cores are flat based and the remaining three are roughly rounded. The size of the specimens ranges from 65×60×40 to 31×33×20 mm. A few elongated flakes have been detached from these. The size-mean of forty-six corresponding flakes is 47.3 mm.

There are three Levallois cores in the industry. All the three are round. The size of the cores is from 54×52×40 to 54×50×32 mm. The size of the two detached flakes is 42×44 and 30×40 mm (size-mean 43 and 35 mm respectively). Seven flakes correspond to this group. Their size mean is 49.3 mm.

Discoidal bifacial cores have two specimens forming 8% of the core group. The size of the two roundish specimens is 53×52×40 and 62×60×50 mm. Though blades have been noticed in the industry, not a single corresponding core is available.

Blanks form 79.6% of the collection having 121 specimens. All the types, except blade with micro striking platform were noticed in the group (cf. Table 6 also Fig. 10). Prepared flakes are the most dominant group of blanks, followed by partially prepared flakes and flakes with unprepared dorsal and prepared striking platform. Levallois element is 8% and blade 4.8%. The occurrence of Levallois point is noteworthy. As is the general trend unfaceted platformed specimens preponderate (57.4%) and are followed by faceted platformed (27.5%) and unprepared (16%) (cf. Table 7 also Fig. 11). Oval is the most frequent shape within the flake group. Besides, a considerable part is also occupied by long and round flakes (cf. Table 8). Broad and irregular shaped flakes form equal proportion (Fig. 12).

The size average range of the flakes in this industry is from 32.8 to 91.5 mm. The representative size-group being 52.2 mm.

NAGARJUNAKONDA-3

The industry comes from the locality 'HG', which was excavated by Sarkar (*IAR*, 1960-61 : 1). This excavation brought to light 'an earlier river bank of Krishna, cut into the granitic bed-rock'. To cite the observations of the investigator, "Palaeoliths, mostly unrolled, were found concentrated at the junction of the pebble-bed and talus, which indicates that the palaeolithic settlement had been established right on the pebble-bed and the accumulation of the talus was a subsequent event" (*IAR*, 1960-61 : 1). The industry under discussion marks advancement over the earlier two industries from the valley (Pant and Jayaswal, 1971 and also Banerjee 1976).

The industry consists of seventy artefacts. The raw material used is medium to fine grained quartzite pebbles. A little rolling can be seen on the implements, which are also patinated in various shades of yellow, brown and purple.

Finished tool group is formed by forty-nine specimens which form 70% of the total tool kit. Though the preponderate type is single side-scraper (26%), the next frequent type is biface (16.3%) which is generally uncommon to the other Middle Palaeolithic industries. Besides, angle-scraper also occupies a good part of the finished tool group for they are 14.2% (cf. Table 5 and Fig. 9). The Acheulean tradition is survived by a few handaxes and cleavers. There are also a few chopper and chopping-implements. Notched tendency in retouched specimens is evident.

Since the industry has only two cores, they do not help much in determining the technological character of the industry. One of the cores is a discoidal bifacial while the other a blade core. The pointed one, a Mousterian core is an oval specimen with 65×58×45 mm as its size. The other specimen is rectangular in shape and bears technological features corresponding to the Levallois blade.

Blanks of the industry are fewer in number than finished tool group, *i.e.*, forty-two forming sixty percent of the total industry. Prepared flakes dominate the blank group (cf. Table 6). Levallois element is conspicuous by its absence, both in the category of blanks (Fig. 10) and cores. However, there is one discoidal bifacial core confirming the existence of Mousterian technique. Besides blade detach ing technique is also represented by one core and one blade. Unfaceted striking platform seems to be very frequent in comparison to unprepared and faceted platformed specimens (cf. Table 7 also Fig. 11).

Oval shaped flakes are most common in the flake-group. The order of frequency of the other shapes is elongated, broad, round and irregular (cf. Table 8). Broad flakes preponderate the unprepared flakes, whereas elongated flakes dominate the flakes of partially prepared group. In the group of prepared flakes, most of the specimens are either oval or broad. The angle-mean of flakes reveals that most of the flakes in this case are wide angled (106.8° angle mean).

The blanks of this industry are quite big in comparison to the other industries. The length-breadth-average range of the flakes is 65-95 mm. The representative size group being 77.0 mm.

MAHADEO-PIPARIA

The Middle Palaeolithic industry from Mahadeo-Piparia was obtained from the sandy pebble gravel and talus deposits on the blanks of the river Narmada (Supekar, 1968 : 39). The total number of artefacts available for study by the author was two hundred and eighty-seven. These are made on quartzite, chert and other fine grained siliceous stones. A majority of them, however, are made on quartzite. The ratio between the specimens made on quartzite to the other fine grained stones is 1.6 : 1. The other noteworthy feature is that the specimens made on quartzite are comparatively less rolled than those of the other group.

The proportion of finished implements is comparatively lower in the present industry, as they are 33.4% of the total collection. Finished implements made on fine grained stones are more than those made on quartzite—1.2 : 1. However, there are more retouched blanks in the group of fine grained stones (1.3 : 1), than of coarse grained (4 : 1 is the ratio between unretouched and retouched blanks).

The chief typological trend of the industry is marked by the dominance of the single side-scraper, followed by double-side-scraper, angle-scraper, blade with marginal retouch, transversal-scraper and end-scraper in the order of frequency (cf. Table 5). Notched tendency in the retouched specimens is frequent.

Not a single core was noticed by the present author in the group of coarse grained specimens, but the fine grained specimens, consist of ten cores. All these are unprepared, irregular shaped specimens.

Except fourteen, all the specimens of the industry can be grouped under blanks (273). One hundred and seventy-seven are made of quartzite and ninety-six of fine grained material. Eighty-six have been converted into finished tools (3.1 : 1).

The general characteristic of blanks of the industry is that they are dominated by prepared flakes, followed by partially prepared flakes (cf. Table 6 and Fig. 10). Levallois element is also in fairly good number. A few blades also appear in both the groups. The occurrence of the Levallois point is also a noteworthy feature. A peculiar feature about the presence of Levallois points is that they are absent in the fine grained material and prevalent only in the group of quartzite implements. Flakes with unfaceted striking platform dominate as is the general trend (cf. Table 7). Faceting of striking platform is also quite common, *i.e.* 31.1% (cf. Fig. 11). Long flakes are the most frequent type, followed by oval, round and broad shaped flakes respectively (cf. Table 8 and Fig 11).

If a comparison is made with regard to the size of the coarse and fine grained, a wide variation is evident (Jayaswal, 1971-72 and also cf. Fig. 18). However, no such difference is noticed if the finished implement types are compared within the two groups.

ADAMGARH

The Middle Palaeolithic industry of Adamgarh comes from sandy red clay, which lies between deposits yielding Lower Palaeolithic and Microlithic industries (Joshi, 1964). This is a very small industry consisting of thirty-eight artefacts only. As they were obtained from the excavation of the shelter, they can be regarded authentic for the detailed study. They are made both on quartzite and other fine grained stones.

The distribution of implements within the finished tool group has been mentioned in the Table 5. It reveals that instead of single side-scraper made on flake, which usually preponderates Middle Palaeolithic industries, scraper on nodule is the chief tool type in Adamgarh (31%). A considerable proportion of double-side scraper and borer is other noteworthy typological feature of the industry (Fig. 9). The reminiscent of the earlier lithic traditions such as chopper and chopping-tool, handaxe and scraper on pebble were observed. The scraper on nodule are made invariably on flattish pieces and can easily be distinguished from those made on pebble, which are made typologically similar to the type to be found in the Acheulean industries of the Lower Palaeolithic phase. The other peculiar feature of the industry is that the finished tools made on cores are more than those made on flakes (1.6 : 1). Purely on typological grounds the present industry seems to be a developed form of the Acheulean tradition obtained from the lower deposits of the shelter.

Only two cores were found during the analysis of the material. Both the oval shaped specimens are discoidal bifacial cores, evidencing Mousterian technique. These specimens measure 50×45×50 and 55×48×40 mm.

Twenty-two blanks of the iudustry form 57.8% of the total collection. Not a single unprepared flake was noticed in it. Prepared flakes predominate, followed by partially prepared flakes, flakes with unprepared dorsal and prepared striking platform and Levallois flakes, respectively (cf, Table 6 also Fig. 10). The last named form 13.8% of the group. The only one blade indicates that blade detaching technique was less in vogue. There is not a single blank with unprepared striking platform. Those with unfaceted striking platform are dominating over those having faceted striking platform (Table 7). The flakes with less preparation on striking platforms are bigger (45.6 mm) but have comparatively lower angle (102.5°) than those having faceted striking platform (size-mean 45.6 mm and angle-mean 104.2°).

The most common shape is long in all the group of flakes except the flakes with unprepared dorsal surface and prepared striking platform. Round and oval flakes are equal in number. No irregular flake has been noticed in the industry (cf. Table 8).

When the industries from Mahadeo-Piparia and Adamgarh are compared some major typological differences are to be noticed. The most noteworthy feature is the overwhelming proportion of blank group in Mahadeo-Piparia (73.4%) while the Adamgarh blank group forms a much lower proportion (57% only). This wide frequency variation of blanks within the two industries does not seem to be influencd by raw material, as both in Mahadeo-Piparia and Adamgarh quartzite and chert nodules are the utilised raw material. As far as the technological features are considered only a few minor variations are revealed between Adamgarh and Mahadeo-Piparia industries. Inspite of somewhat similar technological trends the two also differ widely if the frequency of tool types are compared. Side-scrapers on nodules preponderate Adamgarh, whereas the type is absent in Mahadeo-Piparia. In the latter, like most of the other Middle Palaeolithic industries single side-scraper and double side-scraper made on flakes preponderate. Besides, the implements made in Acheulean tradition are found in Adamgarh, which are absent in Mahadeo-Piparia (Fig. 9). At this place it would be worth remembering that two different typological trends were also noticed in the Lower Palaeolithic remains of the two sites. The earlier tradition at Mahadeo-Piparia was characterised by Clactonian flakes pebble tools and side scrapers made on massive flakes, whereas the one obtained from Adamgarh is a typical Acheulean industry. Can it thus be suggested that the two Middle Palaeolithic industries under discussions are in fact the developed forms of the earlier traditions noticed at Mahadeo-Piparia and Adamgarh, respectively. A further detailed investigation of the areas is necessary to confirm or reject the suggestion.

LUNI

Situated in the basin of Luni and lying within the boundaries of Western Rajputana, the site was brought to light by V. N. Misra (1962). The industry is made of chert. There are six diverses which form 5.8% of the collection.

Finished implements are thirty-six only. The Table 5 reveals that a considerable proportion in this is formed by handaxe-cleaver types and scraper on pebbles (14% and 25% respectively). Single-side scrapers made on flakes preponderate (44.3%). Angle-scraper is the other group with a somewhat higher frequency (Fig. 9). For the existence of end-scraper, blade with marginal retouch are almost negligible with the complete absence of point, borer and burin types. The proportion of finished tools made on cores and flakes is 1 : 1.6.

The core group having ten specimens form 9.7% of the total industry. They can be divided into the following four types. There are two cores with unprepared dorsal surface and prepared striking platform. One of them is oval and the other irregular. Two flakes have been detached from them and eight flakes of the industry correspond with this group. Prepondering type is cores with prepared dorsal and prepared striking platforms (50%). The cores are round, oval and elongated with a single prepared striking platform, from which flakes have been detached in the manner of blades. The two Levallois cores form 20%

of the core group. Both the specimens are round. Only one flake has been detached from one of them. Seven flakes correspond to this group of cores. There is only one discoidal bifacial core which is round. The above account makes it clear that the preference for prepared cores in the industry is obvious. Levallois and partially prepared cores are 20% each, with a single specimen of bifacial discoidal core. No blade core has been noticed by the present investigator.

The most dominant group is of blanks forming 70% of the total industry. Out of seventy-two specimens, twenty-two have been converted into finished tools. Prepared flakes dominate the blank group (cf. Table 6), while the number of unprepared flakes and blades is negligible (cf. Fig.10). However, Levallois element is present in considerably good percentage. Except in Levallois flakes in which broad specimens are the most frequent type all the other flake groups are dominated by elongated flakes (cf. Table 8). As is the general case the unfaceted striking platform preponderates. But faceting of striking platform is also quite frequent (cf. Table 7). The size average of flakes range between 53.4 and 68.8 mm.

MAHULI (RAMGARHWA)

The industry under discussion was obtained from the slopes of the Ramgarhwa Pahar, near the village Mahuli, in Meja tahsil of Allahabad district. The artefacts were collected by P. C. Pant and the present author from a factory site of the region in 1970. On the basis of the nature of the raw material the industry seemed to consist two groups. Our previous analysis, however, reveals that the two do not differ much on typological and technological considerations (Jayaswal and Pant, 1973). All the artefacts numbering two hundred and forty-five are made on medium to fine grained quartzite chunks. They are divisible within the following categories. Finished tools are one hundred and twenty-one forming 49.3%; cores twenty-five forming 10.2% and blanks one hundred and ninety-two forming 31.4% of the industry.

The typological character of the industry is marked by the majority of various types of scrapers (cf. Table 5), with a complete absence of implements of an earlier tradition. Single side-scraper preponderate with a proportion of 38.8%. (cf. Fig. 9).The noteworthy feature is the high frequency of end-scraper (15.7%) and considerable proportion of points. Higher frequency of end-scrapers is a characteristics feature of the Middle Palaeolithic phase of the Vindhyas.

The core group is divisible into the following types :

Unprepared cores are four forming 16% of the group. Two of these are elongated one broad and one irregular. Three flakes have been detached from them. The scars are elongated (2) and broad (2). Only one flake corresponds with this group of core. The mean-size ratio between each core and the flake-scar on them is 1.0 : 2.2 ; 1 : 1.5 and 1 : 1.8, respectively.

Cores with unprepared dorsal surface and prepared striking platform are two. It is almost round core, from which only two broad flakes have been detached. No flake corresponds to this group. The size proportion of the scar with the parent core are 1 : 1.4.

Cores with partially prepared dorsal and prepared striking platform are also two, both of these specimens are oval (1.1 : 1). After a little preparation no flake has been detached from them. Nineteen flakes correspond to this group of core.

Most popular group in this industry is of Levallois cores (14; 56%). The cores are elongated, round and oval shaped. Thirteen flakes correspond to this group of cores. There is no blade core in the industry.

As shown in Table 6, the industry comprises as much as 33.4% of Levallois flakes. However, not a single Levallois point could be noticed by us. The proportion of other blank-types is lower than the Levallois group, *e.g.* the group of prepared flakes are 21.8% and partially prepared 16.8% only. In keeping with the usual trend, blanks with unfaceted striking platform preponderate (57.4%), but the proportion of faceted platformed blanks (22.3%) is considerably higher than the unprepared platformed flakes (cf. Table 7). In quite a few flakes it was not possible to decide their nature (12.6%). This was due to the secondary working on the striking platforms.

Most of the flakes of this industry fall within the group of long specimens—38.9%. This group is followed by round—25.3%, broad and oval flakes (cf. Table 8 also Fig. 12.) Quite a few flakes are irregular shaped.

Size-average of the flakes in this industry ranges from 34.0 to 73.0 mm with 55.5 mm being the mean of the size-range.

JAMALPUR

From the flat top of Kalipahar, near the town of Jamalpur a huge collection of quartzite implements was made by a team which included the present author. This surface find is of homogeneous nature and belongs to the Middle Palaeolithic phase on typo-technological considerations. Our recent classification of the material reveals that the industry of Jamalpur can claim to represent an important variant within the Middle Palaeolithic culture-complex.

The artefacts occur in two different modes at the hill top. Firstly, there are small tools of fine grained quartzite of darker shades, which appear on the surface of the plain in the form of big clusters. These are so rich that almost every piece of quartzite is an artefact. Majority of them is also retouched. Secondly, there are a few bigger artefacts, which occur around the shrubs of the uplands of the plain, nearby slopes and the bed of the rain-gullies. With a view to understanding the nàture of the tool cluster a very small trench (5′×3′) was dug at one such place. From about 50 cms deposit of disintegrated-rocky soil, thirty-two artefacts were recovered. These are techno-typologically similar to the main bulk which was obtained from the surface.

Jamalpur is primarily a flake industry (475). Except for thirty-one flakes which are unretouched, all the others are retouched. Seven specimens fall within the group of unclassified or diverse and seventy-six (10.5%) belong to the core group.

Finished tool group in this industry is formed by five hundred and twenty-nine specimens which form 73.3% of the total. The industry is characterized by a very good proportion of end-scrapers and burins (cf. Fig. 9). Unusual forms in the groups of end-scrapers and burins are those with a pointed tip or ogival end-scraper and alternate beaked burins. Both of these do not appear to have been reported from any of the Middle Palaeolithic assemblages of the sub-continent. Besides these, the other types peculiar to this industry are Jamalpur knife (48), Jamalpur-axe (20) and flakes with chopped off top and retouched corners (18%). It would not be out of place to explain in brief some of these tool types. A Jamalpur knife differs from a simple knife on account of its unusual blunting on the back. While the blunted side of an ordinary knife is invariably convex with almost perpendicular retouch all through the side, in the case of a Jamalpur knife it is either blunted on the upper part of the side, which is generally oblique, or it is thick on account of an intentional breakage and peculiar position of the core preparation scars on the flake. Three different types of this tool have been recognised by us. These three take into consideration the mode of blunting the back and are named A, B, C, sub-types of Jamalpur knife.

Jamalpur axe is invariably made on a flake detached from a prepared core. The working edge is generally formed by the inter-section of a transversal preparation scar on the core. A typical Jamalpur axe contains a few half negative-scars on the dorsal surface and thorough working from the sides towards the centre on the ventral surface. The working end may or may not be retouched, and the bold working of the ventral surface is always confined to the lower portion (cf. Pl. XLVII).

Flake with chopped off top and retouched corners is another peculiar type. The most important feature in this case is that the top of the flake has been at first intentionally chopped off and the two corners created by the breakage have been lightly retouched. Consequently the specimen obtains the shape of a rough square or short rectangle (cf. Pl. XLVII).

The proportion of notched and denticulated specimens in this industry is also quite high, *i.e.*, 65.4%.

The most frequent type in the group of cores is Levallois (44.7%). In this type we could also notice a core from which Levallois-blades were detached. Cores for detaching Levallois blades have gone unnoticed in the palaeolithic collections of the Indo-Pakistan sub-continent. Twenty-one specimens (27.6% of the core group) belong to prepared core group and nine to partially prepared group. There is only one unprepared and three irregular cores. The group of five Mousterian cores form 6.5% of the cores. In the group of blade cores (3), one specimen is made on a thick flake.

The dominant technique employed for detaching blanks is Levallois, followed by prepared-non-Levallois technique. For, in the group of blanks nearly 52% show employment of Levallois technique (cf. Table 6) and 31.1% prepared but non-Levallois technique. The presence of unprepared blanks is almost negligible. There are twenty blades and eight core-rejuvenating flakes. Those specimens which do not show any prior preparation seems to be the first few flakes taken off from the nodules or lump of stones. Although the authors of the industry were acquainted with the technique of manufacturing blades as is evident by the presence of a few blades and blade cores, yet they made their tools mostly on flakes. Most of the flakes have faceted striking platforms. Elongated flakes preponderate and are followed by oval and rounded specimens.

On typo-technological considerations the Jamalpur industry shows close affinities with the Middle Palaeolithic industries found in the region of the river Belan. But it has also quite a few new types in its tool kit. If the notching and denticulation only are to be taken into consideration the Jamalpur industry generally agrees with the denticulated-Mousterian of France, but widely differs from it in respect of other typological details.

Two important questions regarding the Indian Middle Palaeolithic culture-complex are—whether regional variations are possible in the socalled homogenous culture, and, what is the source of the origin of this culture? Quite a few attempts have been made to explain these from time to time. As no stratigraphic divisions within Gravel II itself are possible, the tool types recovered from this gravel cannot be further sub-divided on a stratigraphic basis. Hence, a scientific investigation of the techno-typological features is thought to be helpful. It is proposed to study the proportion of blank-detaching techniques in the light of tool-types, first, and an explaination to the mentioned questions is attempted, thereafter.

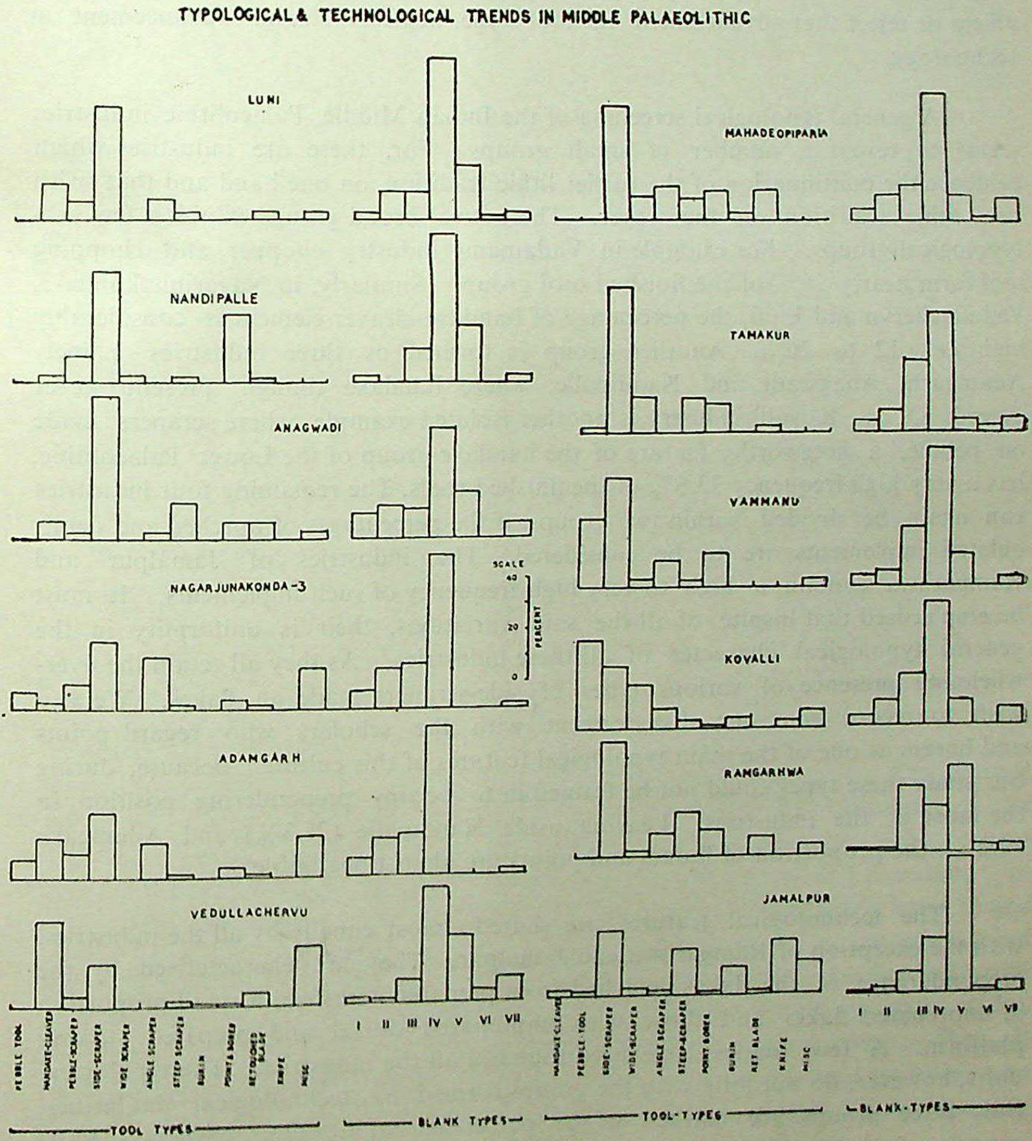


FIG. 9

In general, the number of cores are very limited for convincing statistical analysis. Hence, they have been dropped out in the present study. An analysis of the general typological groups along with a detailed analysis of blank types has been made. The comparative study of the calculated proportions of the crude and evolved tool-types on one hand and the similar techniques on the other, is to examine the hypothesis, whether or not there is a coincidence of similarity in frequencies of evolved tool-types and evolved techniques. Thus we are able to affirm or reject that advancement in tool type neglects similar advancement in technology.

A general typological screening of the Indian Middle Palaeolithic industries seems to reveal a number of small groups. For, there are industries which evidence the coutinuation of the earlier lithic tradition, on one hand and that with new lithic tradition on the other. These two broad groups exhibit a few sub-typological-groups. For example in Vadamanu industry chopper and chopping tool form nearly 26% of the finished tool group. Similarly, in Nagarjunakonda-3, Vedullachervu and Luni, the percentage of handaxe-cleaver element is considerably high *i.e.*, 12 to 26%. Another group is formed by three industries namely Adamgarh, Anagwadi and Nandipalle, where handaxe though present never exceeds 6.9%. Kovalli industry is another isolated example, where scrapers made on pebble, a noteworthy feature of the handaxe-group of the Lower Palaeolithic, has a very high frequency 33.6% of the finished tools. The remaining four industries can again be divided within two groups, if the percentages of notched and denticulated implements are to be considered. The industries of Jamalpur and Ramgarhwa contain a high to very high frequency of such implements. It must be emphasised that inspite of all the said variations, their is uniformity in the general typological character of all these industries. As they all retain the overwhelming presence of various types of side-scrapers made an flakes. We also wish to record here our disagreement with the scholars who regard points and borers as one of the main typological features of this culture. Because, during our study these types could not be framed in to occupy prepondering position in the most of the industries. Leaving aside Nandipalle (26,3%) and Adamgarh 17.2%), the proportion of borers and points are almost negligible.

The technological features are shared almost equally by all the industries, with the exception of Ramgarhwa and Jamalpur. They are characterised by the preponderance of the flakes detached from prepared cores and a small proportion of unprepared flakes and those with unprepared dorsal and prepared striking platform. A few blades have been found in all the industries. The typological units, however, do not tally with the groups formed by technological similarities. But, three groups are marked if the percentage of Levallois element is to be considered (cf. Fig. 10). It is worthwhile to recall that all the five industries which

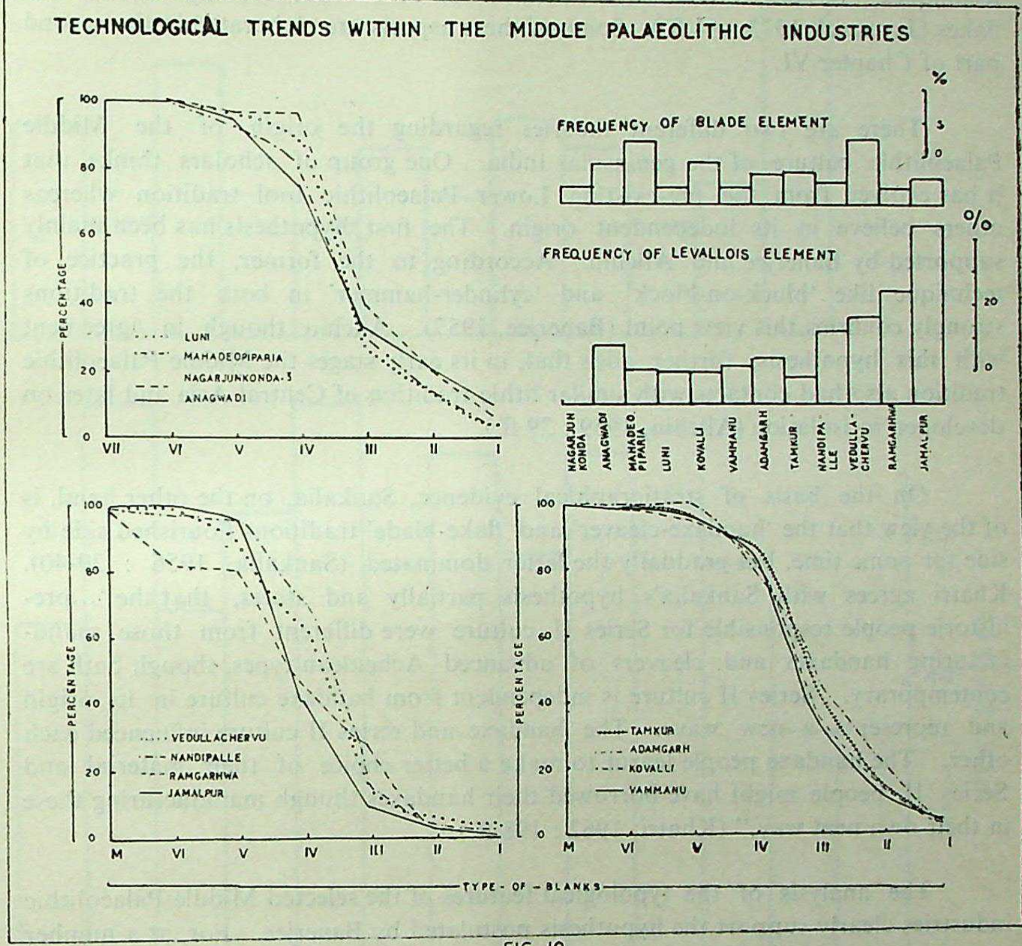


FIG. 10

have considerable proportion of Levallois element are made on fine grained quartzite, while the others on minerals of the quartz group. The industries of the first group which contains the Levallois element inbetween 31.7 and 54.3%, forms the first group. These industries are Vedullachervu, Ramgarh and Jamalpur. In the second group Nanadipalle and Adamgarh can be placed, which have 22 and 18.3% of Levallois element. In all the remaining industries the proportion of Levallois never exceeds 11%. It is worthwhile to recall that all the five industries which have the highest frequency group of Levallois element are made on fine grained quartzite, while the others on the minerals of the quartz group. Thus, it seems that the composition of the raw material rather than the tool typology was the main guiding factor behind the adoption of the certain blank-detaching techniques. Besides, the nature of raw material also influenced the size of the flakes (Jayaswal, 1973 : 64 ff.). Some of these aspects are elaborated in the second part of Chapter VI.

There are two different theories regarding the origin of the Middle Palaeolithic culture of the peninsular India. One group of scholars thinks that it has evolved from the pre-existing Lower Palaeolithic tool tradition whereas others believe in its independent origin. The first hypothesis has been mainly supported by Banerjee and Allchin. According to the former, the practice of technique like 'block-on-block' and 'cylinder-hammer' in both the traditions strongly confirms this view point (Banerjee, 1957). Allchin though in agreement with this hypothesis, further adds that, in its early stages the Middle Palaeolithic tradition also had contacts with similar lithic tradition of Central Asia and later on developed in isolation (Allchin, 1959 ; 29 ff.).

On the basis of stratigraphical evidence, Sankalia, on the other hand, is of the view that the 'handaxe-cleaver' and 'flake-blade' traditions flourished side by side for some time, but gradually the latter dominated (Sankalia, 1956 : 39-40). Khatri agrees with Sankalia's hypothesis partially and states, that the '...prehistoric people responsible for Series II culture were different from those manufacturing handaxes and cleavers of advanced Acheulean types, though both are contemporary. Series II culture is independent from handaxe culture in its origin and represents a new wave. The handaxe and series II culture influenced each other. The handaxe people learnt to make a better choice of their material and Series II people might have borrowed their handaxes though manufacturing these in their own neat way," (Khatri, 1962 : 198 ff.).

The analysis of the typological features of the selected Middle Palaeolithic industries clearly support the hypothesis postulated by Banerjee. For, at a number of sites such as Vedullachervu, Nagarjunakond, Vadamanu, Nandipalle and Adamgarh, the evidences are that the earlier lithic traditions in the respective regions, developed into the Middle Palaeolithic culture. All these industries though flourished into the later lithic tradition, retain the earlier traditions side by side. Besides, all the formerly existing techniques though continue they are marked by a considerable increase of the advanced ones and emergence of blade detaching technique. The example for the proposed hypothesis is well viewed in the region of the Extra Peninsula. In this region, the Middle Palaeolithic assemblages retain the techno-typological features of the Early Soan, though in their evolved form. The flakes now far outnumber the various types of pebble tools. They also show advanced flake detaching techniques including true Levallois. Similarly, the other lithic traditions of the earlier phase evolved into the Upper Clactonian A and B and Upper Stellenbosch assemblages of

POSITION OF STRIKING PLATFORM IN THE MIDDLE PALAEOLITHIC

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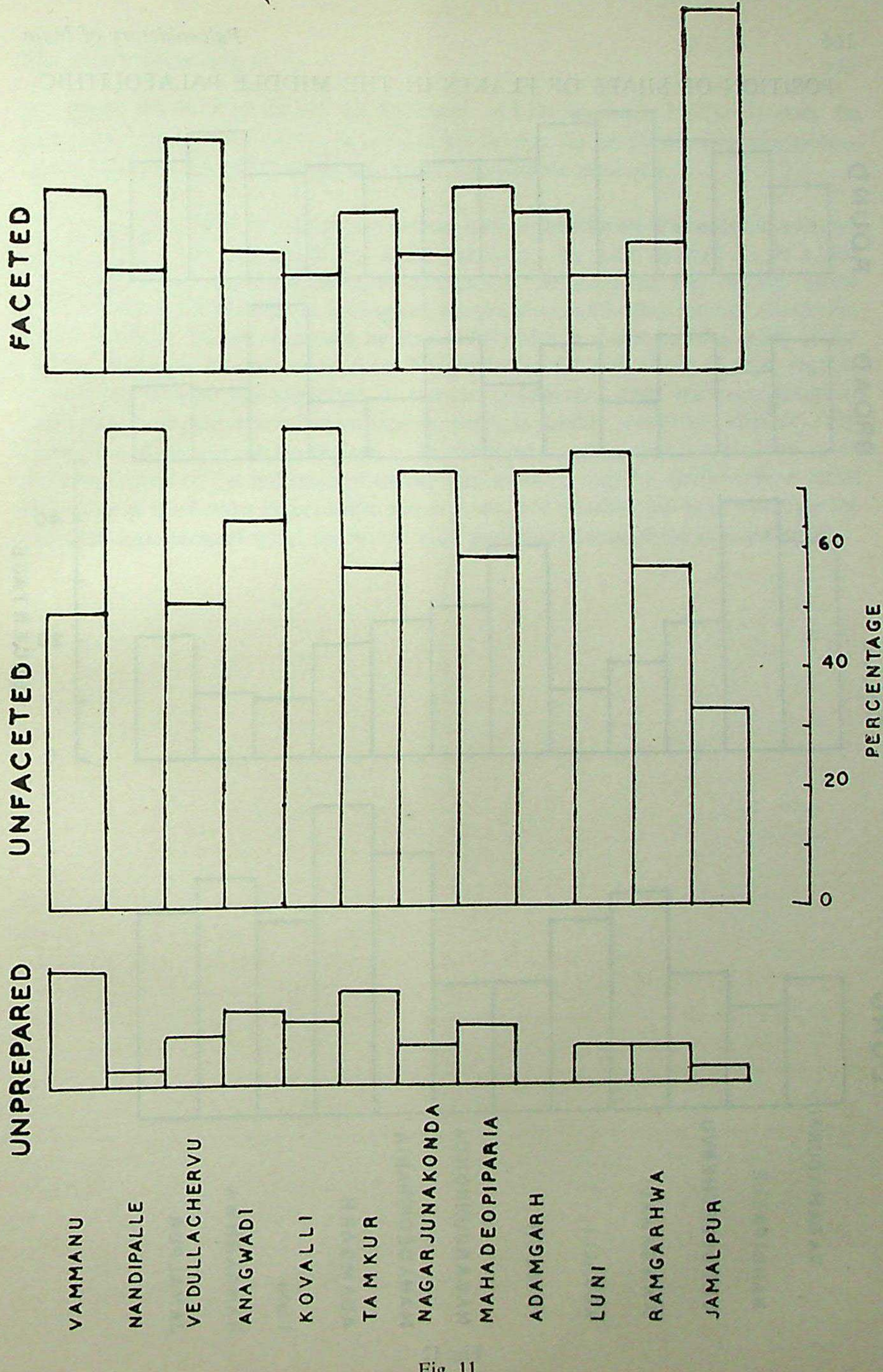


Fig. 11

POSITION OF SHAPE OF FLAKES IN THE MIDDLE PALAEOLITHIC

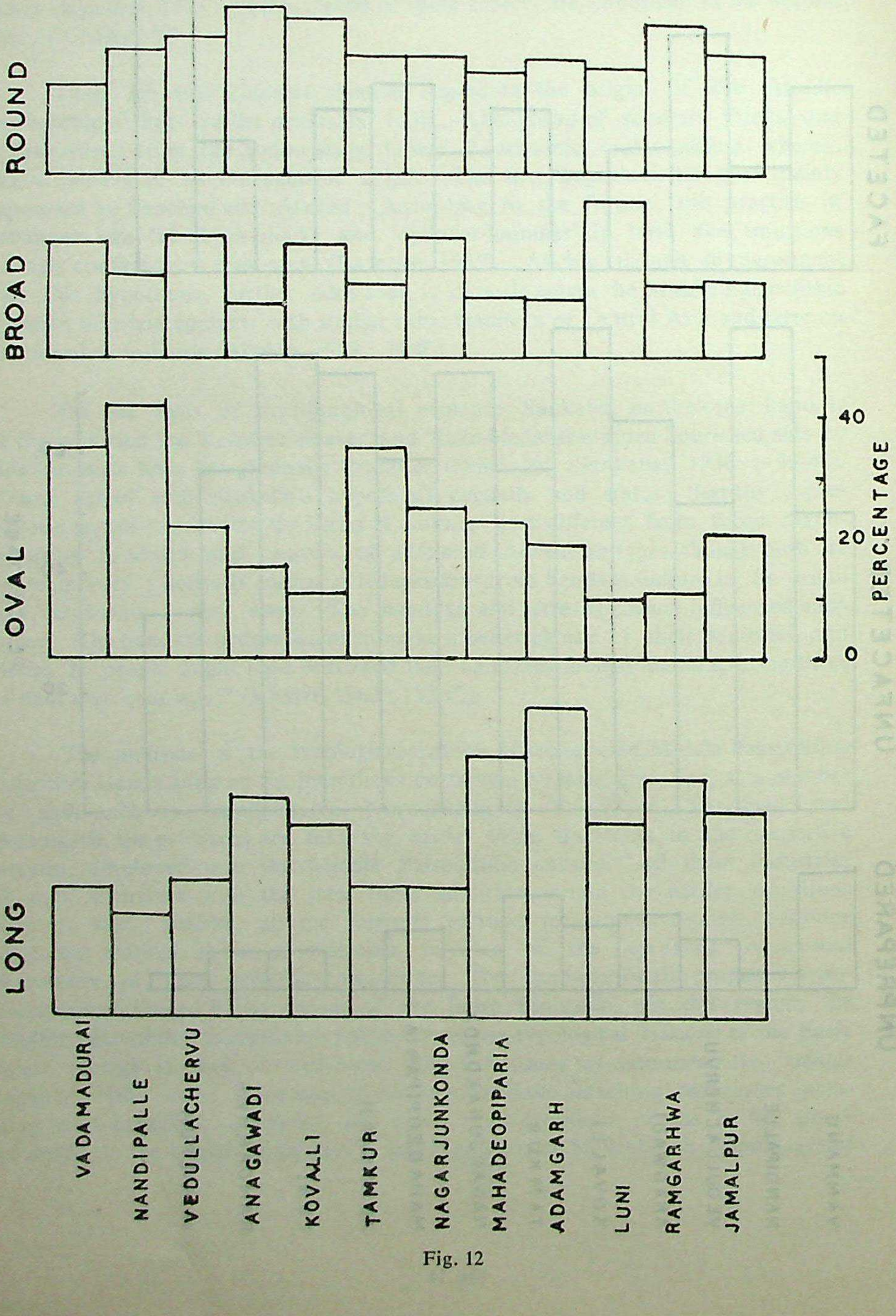


Fig. 12

the upper Pleistocene period (cf. Paterson and Drummond, 1962). It may be mentioned that in the present state of our knowledge the proposal remains hypothetical and needs further investigation based on scientific methods.

The possibility of regional variations within the Middle Palaeolithic culture-complex has been suggested by some scholars. To cite Sankalia... 'in a vast country like India there are bound to be regional variations (in the Middle Stone Age cultures) attributable to ecological, geographical and other factors' (Sankalia, 1965 : 365 ff.). He was followed by Rao (1969) who in a comparative study of the Middle Palaeolithic industries from Nalgonda district with those of other regions in the sub-continent has suggested a similar possibility. Our techno-typological analysis though suggests a few variations, yet it is highly doubtful whether they could be assigned to certain regions. As mentioned earlier, these variations seem to be the result of the influence of earlier traditions. It may be worthwhile to recall that aven in the Lower Palaeolithic phase it was not possible for us to associate the observed typo-technological variations with particular areas of the sub-continent.

TABLE

FINISHED TOOL-TYPES WITHIN

S.	Tool-Types	VMN		NDP		VDCH		TMK		KVL	
No.		No.	%	No.	%	No.	%	No.	%	No.	%
1.	Chopper	6	19.3	—	—	—	—	—	—	—	—
2.	Chopping-tool	2	6.6	—	—	—	—	1	2.7	—	—
3.	Handaxe	0	0	1	5.2	24	17.1	—	—	—	—
4.	Cleaver	0	0	—	—	13	9.2	—	—	—	—
5.	Tranchet	0	0	—	—	—	—	—	—	—	—
6.	Angle-Scraper	3	9.6	—	—	—	—	—	—	8	7.6
7.	Single-Side-Scraper	12	38.7	5	26.3	25	17.1	13	35.1	8	7.6
8.	Double-Side Scraper	1	3.2	3	15.7	10	7.1	8	21.6	17	16.3
9.	Transversal-Scraper	1	3.2	1	5.2	9	6.4	5	13.5	18	17.3
10.	Round-Scr.	1	3.2	1	5.2	2	1.4	2	5.4	4	3.8
11.	End-Scraper	—	—	—	—	2	1.4	3	8.1	—	—
12.	Burin	—	—	—	—	2	1.4	—	—	1	1.0
13.	Borer/Awl	1	3.2	—	—	—	—	1	2.7	—	—
14.	Point	3	9.6	5	26.3	2	1.4	3	8.1	1	1.0
15.	Scraper on Core	—	—	2	10.5	7	5.0	—	—	35	33.6
16.	Blade with marginal Ret.	—	—	1	5.2	7	5.0	1	2.7	4	3.8
17.	Uniface	1	3.2	—	—	3	2.1	—	—	—	—
18.	Biface	—	—	—	—	21	15.0	—	—	8	7.6
19.	Discoid	—	—	—	—	9	6.4	—	—	—	—
20.	Knife	—	—	—	—	—	—	—	—	—	—
21.	Jamalpur Type* Implements	—	—	—	—	—	—	—	—	—	—
22.	Miscellaneous	—	—	—	—	5	3.5	—	—	—	—
	Grand Total	31	99.8	19	99.6	140	99.5	37	99.9	104	99.8

*This group includes three finished tool types, which were noticed only in Jamalpur top and retouched corners.

5

THE MIDDLE PALAEOLITHIC

ANG		NGK		MPR		ADG		LNI		RMG		JMP		Total
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
—	—	2	4.1	—	—	1	3.4	—	—	—	—	8	1.5	17
—	—	2	4.1	—	—	1	3.4	—	—	—	—	2	0.3	8
2	6.9	6	12.2	—	—	1	3.4	4	11.1	—	—	16	3.0	54
—	—	2	4.1	—	—	—	—	1	2.7	—	—	—	—	16
—	—	—	—	—	—	—	—	—	—	3	2.4	8	1.5	11
1	3.4	7	14.2	13	13.5	6	20.6	3	8.3	11	9.0	12	2.2	64
16	55.1	13	26.5	28	29.2	9	31.0	16	44.4	47	38.5	79	15.0	270
—	—	—	—	14	14.6	3	10.3	—	—	13	10.0	61	11.5	130
—	—	—	—	9	9.4	—	—	—	—	3	2.4	18	2.9	64
—	—	—	—	—	—	—	—	—	—	2	1.6	2	0.3	14
4	13.8	1	2.0	8	8.3	1	3.4	1	2.7	19	15.7	79	15.0	118
—	—	—	—	3	3.1	—	—	—	—	—	—	58	10.9	64
—	—	—	—	2	2.1	3	10.3	—	—	2	1.6	3	0.5	12
2	6.9	2	4.1	10	10.4	2	6.9	—	—	11	9.0	3	0.5	44
1	3.4	5	10.2	—	—	2	6.9	9	25.0	—	—	—	—	61
2	6.9	1	2.0	9	9.4	—	—	1	2.7	9	7.4	8	1.5	43
—	—	—	—	—	—	—	—	1	2.7	—	—	—	—	5
1	3.4	8	16.3	—	—	—	—	—	—	—	—	—	—	38
—	—	—	—	—	—	—	—	—	—	—	—	—	—	9
—	—	—	—	—	—	—	—	—	—	—	—	24	4.4	24
—	—	—	—	—	—	—	—	—	—	—	—	86	17.0	86
—	—	—	—	—	—	—	—	—	—	2	1.6	62	12.0	69
29	99.8	49	99.8	96	100.0	29	99.6	36	99.6	122	99.2	529	100.0	1221

tool kit. These are Jamalpur knife, Jamalpur axe and flakes with chopped off

TABLE

BANK-TYPES IN

Types	VMN		NDP		VDCH		ANG		KVL		TMK	
	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
I unpre.	3	4.0	2	3.4	7	3.4	8	9.8	5	3.7	6	4.9
II	3	4.0	—	—	2	1.0	7	8.5	14	10.3	7	5.7
III	2	2.6	—	—	1	0.4	2	2.4	—	—	4	3.3
IV P pre.	2	2.6	—	—	4	2.0	1	1.2	6	4.4	5	4.1
V	11	14.6	6	10.1	10	4.9	6	7.3	16	11.7	22	18.2
VI	4	5.3	2	3.4	5	2.4	3	3.6	5	3.7	7	5.7
VII Pre.	10	13.3	—	—	9	4.5	2	2.4	4	2.9	8	6.6
VIII	16	21.3	31	52.5	55	27.0	27	32.9	50	36.7	30	24.8
IX	13	17.3	3	5.0	25	12.2	6	7.3	13	9.5	16	13.2
X Lev. fl.	6	8.0	8	13.5	28	13.7	9	11.0	12	8.8	5	4.1
XI	3	4.0	5	8.5	26	12.7	6	7.3	2	1.4	2	1.6
XII L. Point	—	—	—	—	11	5.3	—	—	—	—	3	2.5
XIII Blade	1	1.3	2	3.4	10	4.9	5	6.0	7	5.1	2	2.5
XIV	1	1.3	—	—	11	5.3	—	—	2	1.4	3	2.5
Undet.	—	—	—	—	—	—	—	—	—	—	—	—
Grand Total	75	99.6	59	99.8	204	99.7	82	99.7	136	99.6	120	99.7

6

MIDDLE PALAEOLITHIC

NGK-3		MPR		ADG		LNI		RMG		JMP		Total
Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	
3	7.3	11	4.8	—	—	2	2.8	1	1.3	2	0.4	50
4	9.8	21	8.0	4	18.1	8	11.1	1	1.3	5	1.1	76
2	4.9	5	1.8	1	4.5	—	—	—	—	3	0.6	20
—	—	6	2.2	—	—	—	—	—	—	5	1.0	29
6	14.6	33	12.0	4	18.1	6	8.3	13	16.8	15	2.9	148
1	2.4	6	2.2	1	4.5	2	2.8	7	9.0	20	4.1	63
—	—	11	4.0	—	—	3	4.2	2	2.5	8	1.6	57
20	48.7	74	27.5	7	31.8	33	45.8	8	10.3	50	10.0	401
4	9.8	50	18.3	1	4.5	9	12.5	4	5.1	90	19.0	234
—	—	18	6.5	—	—	6	8.3	12	15.5	75	15.0	179
—	—	10	3.7	3	13.8	1	1.4	14	18.1	164	38.3	236
—	—	2	0.6	—	—	—	—	—	—	5	1.0	21
—	—	13	4.7	1	4.5	2	2.8	2	2.6	15	2.9	60
1	2.4	13	4.7	—	—	—	—	—	—	5	1.0	36
—	—	—	—	—	—	—	—	13	16.8	10	2.1	23
41	99.9	237	99.8	22	99.8	72	100.0	77	99.4	472	99.9	1633

TABLE 7

NATURE OF STRIKING PLATFORM IN MIDDLE PALEOLITHIC

Industry	Unprepared		Unfaceted		Faceted		Undetermind		Total
	Nos.	%	Nos.	%	Nos.	%	Nos.	%	
Vadamanu	15	20.0	37	49.3	23	30.6	—	—	75
Nandipalle	2	3.3	47	79.6	10	16.9	—	—	59
Vedullachervu	20	9.7	104	51.2	80	39.0	—	—	204
Angwadi	11	13.4	54	65.8	17	20.0	—	—	82
Kovalli	15	11.0	99	79.9	22	16.1	—	—	136
Tamakur	20	16.0	70	57.4	31	27.5	—	—	121
Nagarjunakonda-3	3	7.3	30	73.1	8	19.5	—	—	41
Mahadeo-Piparia	28	10.2	160	58.7	85	31.1	—	—	273
Adamgarh	—	—	16	72.8	6	27.2	—	—	22
Luni	5	6.9	55	76.4	12	16.6	—	—	72
Ramgarhwa	13	6.9	108	57.4	42	22.3	24	12.6	187
Jamalpur	15	2.9	160	33.6	300	61.4	10	2.1	485
Grand Total	147		940		636		34		1757
Percentage	8.3		53.5		36.1		1.9		99.8

TABLE 8

SHAPE OF FLAKES IN MIDDLE PALAEOLITHIC

Industry	Long		Oval		Broad		Round		Irregular		Total
	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	
Vadamanu	16	21.9	26	35.6	14	19.1	11	15.0	6	8.2	73
Nandipalle	10	17.5	24	42.1	8	14.0	12	21.0	3	5.2	57
Vedullachervu	40	23.3	38	22.2	35	20.4	39	22.8	19	11.1	171
Anagwadi	29	37.1	12	15.3	7	8.9	22	28.2	8	10.2	78
Kovalli	41	32.2	14	11.0	24	18.8	34	26.0	14	11.0	127
Tamakur	25	22.1	39	34.5	13	11.5	23	20.3	13	11.5	113
Nagarjunakonda-3	9	22.5	10	25.0	8	20.0	8	20.0	5	12.5	40
Mahadeo-Piparia	109	43.6	57	22.8	24	9.0	44	17.6	17	6.8	251
Adamgarh	11	52.3	4	19.0	2	9.5	4	19.0	—	—	21
Luni	23	32.8	7	10.0	18	25.7	12	17.1	10	14.2	70
Ramgarhwa	60	38.9	17	11.0	19	12.3	39	25.3	19	12.3	154
Jamalpur	155	35.3	98	20.5	60	12.5	97	20.4	48	11.2	458
Grand Total	528		346		232		345		162		1613
%	32.7		21.4		14.3		21.3		10.0		99.7

CHAPTER V

The Upper Palaeolithic

The Upper Palaeolithic is the most controversial and least known phase of Indian Prehistory. It has been frequently addressed by such names as 'blade-burin' or 'blade-flake' culture etc. Compared to this, the European Upper Palaeolithic, particularly that of the western part of the continent, is the best studied phase of its Prehistory, though still debatable on various issues. Geologically, its various cultures belong to middle and upper Würm, a period lying between the different Mousterian cultures of the Middle Palaeolithic phase on one hand and the Maglemosian culture of the Mesolithic on the other. Culturally, it is characterised by a new lithic tradition of blades and burins, very rich bone industries the specimens of which are also at times decorated, and above all various forms of art activities including painting, engraving, terracotta, bone and stone sculpture. As compared to this, it should be unhestatingly admitted, what may be termed as Upper Palaeolithic in India is neither geologically nor culturally well defined. There are only a few localities where the industries of this phase have been found in stratified deposits. Even in such cases the dates given to them are very approximate and hardly based upon any convincing scientific consideration. But typologically they show a definite preference for blades and blade-tools. Under the circumstances, these industries can be grouped under the head Upper Palaeolithic, only tentatively.

As soon as one takes up the problem of dating and chronology of the Upper Palaeolithic industries of the Indo-Pakistan sub-continent for consideration, one lands oneself in difficulty. For, there is only one ^{14}C date available for this phase *i.e.* 19,715 ± 340 B.C. (Agrawal and Kusumgar, 1974). There are only a few assemblages which come from river deposits, the rest are surface collections. The river sections indicate that the phase overlies the preceding Middle Palaeolithic or 'Middle Stone Age' industries and is succeeded by microlithic industries. Unfortunately, the faunal evidence also, as in case of other phases, does not help in fixing any definite chronology. Thus, the information we gather from these river deposits is limited to the relative stratigraphical position of this phase. On typological considerations it has been assigned to Upper or Late Pleistocene and Early Holocene. According to Rajguru and Hegde, the associated Middle Pleistocene fauna with 'Evolved Middle Stone Age' or Upper Palaeolithic blade tools in Peninsula could be taken as the late survivals of earlier species and could be dated to 'Upper Pleistocene' (Rajguru and Hegde, 1972).

The first indirect reference to the existence of 'Upper Palaeolithic' in India was made by Foote. He claimed to have discovered a few bone implements from Billa Surgam caves in Kurnool and thought them to be comparable to Magdalenian of France (Foote, 1916).

In subsequent years Todd collected a 'big flake' assemblage in association with pebble tools and discoids from Dhok Pathan, a few miles away from Pindigheb in West Punjab (Todd, 1939). The investigations of De Terra and Paterson in the same region dated the assemblage to the fourth glaciation. This dating is based mainly upon the typological similarity of the assemblage with Late Soan industries which have already been assigned to the said period. There is also a possibility that the assembage is even later than the 'Late Soan' industries (De Terra and Paterson, 1939). Some similar collections were later made and named 'Evolved Soan' by Movius. It is still a matter of controversy, whether these assemblages should be regarded as parts of the Upper Palaeolithic culture-complex of the sub-continent.

The excavations of the localities near Morahana Pahar in the Rewa district of Madhya Pradesh and Sangankallu in Andhra Pradesh have yielded some interesting clues with regard to the stratigraphical position of this phase. At these places microlithic yielding layers rest on a deposit known to have revealed comparatively large flakes—tools or 'Macrolithic' assemblages. For the latter deposit V. D. Krishnaswami in agreement with Gordan (Gordan, 1950 : 64) says "...there was a later Upper Paleolithic blade and burin industry corresponding to the late Magdalenian" (Krishnaswami, 1953).

Todd has also reported, one 'Series III' assemblage from the stratified deposits at Kandivali (near Bombay), which is characterised by blades and burins (Todd, 1939). This industry is said to be akin to the Aurignacian industries of Asia and similar other industries of Europe and Middle East. A passing reference to a similar industry is also made by Krishnaswami while he discusses the palaeolithic phase of Kortalayar basin. Here the Terrace which is 8′ high seems to contain implements assignable to Upper Palaeolithic tradition (Krishnaswami, 1938). A few other stray finds have been reported by S. P. Gupta from Jabalpur region, by Malti Nagar from Ahmednagar, Maharashtra (Nagar Malti, 1970), and by Raman from Madurai district of Tamilnadu (*IAR*, 1960-61). Beside the above mentioned stray finds a few collections containing a good number of artefacts came from stratified deposits. To mention the important ones, Issac made a collections from Kurnool district (Issac, 1960), A. K. Ghosh from Singhbhum district of Bihar (*IAR*, 1965-66), G. R. Sharma from Belan basin (*IAR*, 1968-69), M. L. K. Murthy from Chittoor district of Andhra Pradesh (Murthy, 1966 and also 1968) and K. Paddayya from Shorapur Doab of the same state (Paddayya, 1968). Almost all of these collections, except that from Singhbhum, were handled by the author personaly. Only a brief account is possible on the collections from Kurnool and Shorapur Doab, which were available for first hand study, in the Deccan College, Poona. Similarly the Upper Palaeolithic artefacts from Belan basin are also very few for any detailed typological analysis. The industries from Chittoor district of Andhra Pradesh have been discussed in detail and a brief account has been presented on all the others. Due to the techno-typological peculiarities of these assemblages it was felt necessary to change the usually adopted method of classifying the artefacts of the preceding chapters.

The five comparatively well known groups are, from south to north, Chittoor, Kurnool, Shorapur Doab, Singhbhum and Belan. They are being discussed in detail in the following pages.

Chittoor District Group

Chittoor district was surveyed by Murty in search of palaeolithic settlements (Murty, 1969). Besides the Lower and Middle Palaeolithic industries, he discovered four implementiferous localities of 'blade and burin' tradition. They are situated on the banks of the river Rallakalava near the villages Timmyyagunta, Venkamanayanipalli, Chendi and Vedullachervu. All the four are situated to the the north-east of Renigunta (a rail link on the Madras-Bombay route) in the eastern part of the Chittoor district in the coastal Andhra Pradesh (Murty, 1969).

Vedullachervu has been regarded as the representative industry of the phase for two reasons. Firstly, it has yielded the largest number of artefacts and secondly, a complete sequence starting from Lower Palaeolithic to Upper Palaeolithic has been reported from this place and the Upper Palaeolithic industry comes from a well stratified deposit. On relative chronological grounds it is said to be of 'late Upper Pleistocene or early Holocene' age (Murty, 1969). In the following pages we propose to discuss the available material in detail.

The artefacts of Vedullachervu industry are made of fine grained quartzite and are lightly patinated into grey and purple colours. They are of the following types :

Finished Tool-Types		Nos.	Percentage
Side-scraper			
	On flake	10	
	On Core	1	
	Total	11	7.6
Point			
	On simple flake	2	
	On Blade	21	
	Levallois point	8	
	Total	31	21.7
	Macro-lunate	13	
	Backed blade	9	
	Blade with retouched margin	5	
	Total	27	18.8
Burin			
	On Core	35	
	On flake	10	
	On blade	26	
	Total	71	49.6
End-Scraper			
	On flake	3	
	On blade	1	
	Total	4	2.7
Sum	Total :	143	100.8

The finished tool group is dominated by burins. Those made on cores far outnumber the other types (PL. XLIX, 22-30, 35). Points are the next dominant type. The occurrence of Levallois points is noteworthy. The Macro-Lunate (Pl. XLIX, 5-9) is a new type, appearing for the first time in this phase. Thick elongated flakes in this case have been reworked on one of their sides at high angle to make them convex. The type seems to be similar to the Azilian point of Europe. The blunting of blades on the sides is also quite frequent. There are also a few blades with marginal retouch at low angle. The number of end-scrapers is not very encouraging and this feature marks a noteworthy contrast between this industry and those of European Upper Palaeolithic. Round Scrapers are completely absent in the industry.

Unclassified artefacts are only twenty three.

Although Murty has mentioned two 'flat-based' cores (Murty, 1966), yet not a single core was noticed by the author.

Blanks have been first classified into three broad groups, *viz.*, blade, flake and undetermined blank, thereafter the first two into various sub-types. The third group of undetermined blanks consists of ten broken flakes and blades (6%) which cannot be definitely classified into either of the above two blank groups.

The following types have been noticed in flake group :

Type	Nos.	Percentage
Prepared	34	56.6
Levallois flake	4	6.8
Levallois point	8	13.5
Undetermined flakes	13	22.0
Total	59	99.9

Prepared flakes overwhelmingly predominate in the group of flakes. Levallois element does not occur in very good percentage. A number of shapes have been noticed in the group of prepared flakes. They are : elongated—12, broad—10, oval—6, round—4 and irregular—2. Levallois flakes are only oval and round-shaped. The proportion of various types of striking platforms within the flake group is as follows :

Nature of Striking Platform	Nos.	Percentage
Unprepared	5	8.5
Unfaceted	20	34.0
Faceted	10	17.0
Undetermined	24	40.5
Total	59	100.0

If we leave aside the undetermined type, flakes with unfaceted striking platform are the most dominant type followed by faceted and unprepared types in the receding order. The size of the flakes ranges between 22 and 60 mm with a mean of 44 mm. The mean of the angle of prepared flakes is 115°, Levallois flakes 105° and Levallois points 95° only.

Blade (97, 59%) is the most dominant type in the blank group. Six specimens are preparatory blades, which form 6.2% of the blade group. Although the specimens are elongated and also have almost parallel sides yet they are characterised by plano-convex cross-section (Movius, 1968), as the dorsal surface of these is unprepared and cortexed.

The other specimens have either triangular or trapezoidal cross-section. The blades with triangular cross-section are 35, forming 36.0% of the blade group, while the blades with trapezoidal cross-section are as many as 56 (57.7%). Broken blades are only twenty-one (21.6%). The specimens (25) with undetermined striking platform include two types. In case of the first, the lower part is broken and in the other due to secondary working on or near the striking platform its nature cannot be determined. On the basis of the nature of the striking platform the blades can be classified as follows :

Nature of the Striking Platform	Nos.	Percentage
Unfaceted	32	33.0
Faceted	25	25.7
Micro	15	15.5
Undetermined	25	25.7
Total	97	99.9

As evident from the above table, blades with unfaceted striking platforms are the most dominant type, followed by faceted and micro striking platforms. Seven specimens of the group have pointed distal end.

On the basis of length, breadth and thickness, the blades fall under the following ranges:

Length	Breadth	Thickness
20—29 mm= 6	1— 9 mm= 8	1— 4 mm= 8
30—39 mm=38	10—19 mm=55	5— 9 mm=65
40—49 mm=36	20—29 mm=30	10—14 mm=24
50—59 mm=12	30—39 mm= 4	
60—69 mm= 5		
Mean=42.0 mm	Mean=19.3 mm	Mean=9.00 mm

The following table shows the various angle-ranges under which the baldes of the industry may be put.

70°— 79°= 1
80°— 89°= 4
90°— 99°=30
100°—109°=35
110°—119°=12
Mean—101.4°

The general ratio between length and breadth of the blades is 2.2 : 1 and that between length and thickness 4.6 : 1. If these general ratios are any indication, the blades of the industry are neither very thick nor very long. Very small and very large specimens are rare.

Kurnool District Group

The 'Series III' assemblage of the region is said to be 'blade-burin' industries, which stratigraphically lie between the 'Middle Stone Age' or Series II and Microlithic or 'Series IV' (Issac, 1960). The first discovery of Upper Palaeolithic artefacts in the region was made by Burkitt and Cammiade, who found such tools near Giddalur and Nandipakkam (Cammiade and Burkitt, 1930). Thereafter Soundara Rajan discovered a few similar implements (Soundara Rajan, 1952). The whole district was examined by Issac later on, who brought to light as many as twenty-nine localities of this phase.

Most of the artefacts of this phase either come from the surface of the fields or from the gravel deposits lying loose in the river bed. Besides, they have also been reported to be found with Middle Palaeolithic assemblage of the region : though it could not be ascertained yet on typological grounds they seem to belong to the Upper Palaeolithic tradition.

All the twenty-nine localities have been reported from two areas, *viz.*, Erramaliay and Nallamalai. Eight of them are in Erramaliay, which have yielded three hundred and fifty-seven artefacts, only thirteen out of which come from stratified deposits. The remaining twenty-one localities fall in Nallamalai area. Three hundred and seventy artefacts have been reported from this area, among which only sixty-three were found *in situ* from the stratified deposits (Issac, 1960).

The seven hundred and eighty-two artefacts from the two areas are made of fine grained stones like chert, jasper, agate, chalcedony etc. The investigator has mentioned the following types :

Points	214
Scrapers	190
Axe-types	31
Borers	22
Picks	7
Burins	48
Crescentics	12
Trapezoidals	23
Flake-blades	29
Blades	170
Awls	6
Cores	11
Total	782

The types have been subdivided into quite a few groups. Only a small part of this collection was made available to the present author in the Deccan College, Poona, by the courtesy of Prof. H. D. Sankalia. Hence, only brief general observations are presented below.

In the collection a few small oval bifacially worked points are interesting to note. Notching in implements is also very frequent, steep retouching predominates and can be noticed on end—and round scrapers and backed blades. Points and burins seem to occupy a good percentage in the collection.

As far as core types are concerned only two small Mousterian cores and a few blade cores were noticed. But the blank group comprises all the types of flakes and blades. Unprepared flakes and flakes with a little preparation are almost negligible. Prepared flakes are abundant, with a good proportion of Levallois element. Blades are very frequent in the industry. Faceting of the striking platform seems to be a very common feature of the industry. Micro and unfaceted striking platforms come next in the order. The length of the blades ranges between 40 and 90 mm, and their thickness between 6 and 25 mm.

In general the assemblage does not seem to be very evolved and can probably be assigned to the early phase of the Upper Palaeolithic tradition.

Shorapur Doab

Only two localities in Shorapur Doab have yielded Upper Palaeolithic or 'blade-burin' industries. They are SALVADGI and MERALBHAVI. The first site was discovered by Sundara (*IAR*, 1960-61 : 64) and was revisited by Seshadri (Paddayya, 1970). After a few years Paddayya undertook a small scale excavation at the same locality (Paddayya, 1968). The other site Meralbhavi is the discovery of the later investigator. The 'blade-burin' industry from the two is stated to be found in the black-brown silt which either overlies or rests against the 'Middle Stone Age' tool bearing gravels. Hence, it has been concluded that the formation of the silt took place in post-Pleistocene, *i.e.*, in 'Early Holocene Period' (Paddayya, 1968), and so the term blade-burin industry is to be preferred against Upper Palaeolithic.

The material from Salvadgi and Meralbhavi, though was available to the present author in the Deccan College, Poona, the detailed techno-typological study of this was almost impossible due to some unavoidable conditions. The Salvadgi industry, which comes from excavations, is said to be mixed up with "Middle Stone Age' assemblage. The total number of artefacts recovered by the excavator is 767, out of which he has rejected as many as 542. He further classifies the remaining 225 implements into flakes (49) and blades (176). The flakes have been arbitrarily assigned to 'Middle Stone Age' tradition (taking for granted that perhaps they cannot be assigned to any other phase) and the blades to 'blade-burin tradition'. This classification certainly does not help much, for, there seems to be no stratigraphical evidence to suggest that the two types should necessarily belong to two different traditions. Besides, the total number of artefacts from the site, which was available to the author, is very small. Hence the assemblage from Salvadgi could not be studied in detail.

The other locality, Meralbhavi, which is two miles south of the Salvadgi, is also said to have yielded a mixed assemblage of 'Middle Stone Age' and 'blade-burin' traditions. Four hundred and forty-six artefacts in this case were picked up from the surface of fields. The material available to the author consisted of only forty-three specimens which were illustrated by the investigator in his Doctoral dissertation. Under these circumstances it was neither possible nor desirable to study the material in detail, hence here is a brief account of the techno-typology of the available artefacts.

Finished tools as reported by Paddayya are one hundred and ninety-one, which have been reclassified as edged tools (137), non-edged tools (46) and multi-edged tools (8). Fourteen burins were noticed by the investigator. The nineteen cores from this locality are 'fluted' from which a number of blades have been detached. As mentioned above the investigator has not assigned a single flake to this 'blade-burin' assemblage. 'Core flakes' are nine. There are a few primary flakes and they are..."detached in the process of dressing the nodules selected for the production of blades. They are usually thick and elongated. A large area of dorsal surface is made of cortex." The core-rejuvenation flakes are three and the remaining ones are blades. We have observed that the length-range of the blades is 21 to 90 mm, but most of the specimens fall in between 31 and 50 mm. The thickness-range of the blades is from 11 to 30 mm.

Both the industries of the area are made of quartz minerals. As already mentioned, no intensive techno-typological analysis has been possible in case of these two assemblages.

Bombay

The coastal land around Bombay is known to have yielded the first few recognised implements of the Upper Palaeolithic phase. Todd published a sequence of lithic industries in and around Bombay area in 1939 (Todd, 1939). From the top of the 'upper gravel' he reported to have obtained a blade and burin industry which was regarded Upper Palaeolithic (or Series III). Thereafter, from the 'Upper clay' (which overlies the upper gravel) he discovered polyhydral, angle and parrot burins, which, according to him, belong to 'a more evolved class of blade and burin industry'. These industries consist of artefacts like steep-scrapers, burins, borers, blades, blade-cores, knives etc.

Malik re-examined the area after a considerable gap of time (*IAR*, 1956-57 : 78). From the upper gravel of a 12 to 14 feet thick section exposed near Borivali, he claimed to have obtained an industry similar to that formerly reported by Todd (Malik, 1957). This group of tools, made of mineral of the quartz group, has been named as 'flake-blade-scraper' industry, which, according to Malik, comprises side-scrapers, end-scrapers, borers, blades, etc. "Typologically, that is in size, type and function of its tools, it is somewhat similar to Upper Palaeolithic of Europe" (Malik, 1957). Malik holds that the rarity of burins in this industry is due to "Environmental differences."

The collections made by Todd and Malik were not available to the author for study. But the one made by Sankalia along with Misra and Mohapatra was studied by her in the Deccan College, Poona. Surprisingly, it does not contain any Upper Palaeolithic industry. This latter survey seems to have yielded only two phases, *viz.* Series II and Microlithic.

It was also observed that the concerned section which had been divided into many sub-groups by Todd and Malik, could not really be done so. At the most, two divisions were possible, both yielding tools of Series II (*IAR*, 1960-61 : 22).

Singhbhum

The Upper Palaeolithic assemblages have been reported from four areas of the region under study. These are CHANDIL, SINI, GHATSILA and GUA in Singhbhum. The implements of this phase have been obtained from 'Upper Clay', the top of which marks the end of the Pleistocene and beginning of the Holocene period, and have been dated to 'Late or Upper Pleistocene' (Ghosh, 1970). Unfortunately, the author could not lay her hands on these collections, and thus had to depend on the observations made by the investigator.

The industry comprises tools made of jasper, agate and various other similar minerals. This industry is comparatively much smaller than the 'chopper-biface' and 'flake' industries of this region, The former forms only 20.48% of the total palaeolithic collection of the area, whereas the later two are 48.29% and 31.23%, respectively.

The largest number of tools was obtained from Chandil area (36.18%), followed by Sini (26.19%), Ghatsila (22.86%) and Gua (14.77%) areas in that order. The number of artefacts from each area is so limited that, if studied separately, no definite conclusions can possible be derived.

The frequency of the artefact types in each area is as follows :

'Flake-Blade' Industry

Types	Chandil	Sini	Ghatsila	Gua	Total	Percentage of each type
Chopper	—	25	—	—	25	11.91
Scraper	38	24	33	17	112	53.32
Point	15	—	3	7	25	11.91
Blade	12	1	4	2	19	9.05
Knife	—	3	1	—	4	1.91
Borer	—	1	—	2	3	1.43
Burin	2	—	—	—	2	0.95
Core	9	1	7	3	20	9.52
Total	76	65	48	31	210	100.00

Typologically, the 'Flake-blade' industry under discussion is dominated by scrapers (53.32%). This group includes at least eleven types, *i.e.*, side, end and steep scrapers on cores, flakes and blades, and also side-cum-end-and hollow scrapers. Many of them are made on Levallois flakes. The next dominant groups are finely worked out small choppers and points. But surprisingly the knives, borers and burins form very low percentage of the industry.

The technological details of the industry are not known in detail from the published account. All the flakes seem to be converted into finished tools. Levallois technique for detaching flakes and points was perhaps common in practice. Their number and proportion are not known. Blades seem to form a good part of the industry. They include both unretouched and finished tools. Cores for detaching flakes and blades are twenty (9.52%). Unfortunately no detail about their size, shape and other technological aspects is given in the publication.

On the basis of the above, one feels that the techno-typology of the Upper Palaeolithic or 'Flake-blade' phase of Singhbhum is somewhat similar to other such industries of the sub-continent. But the proportion of burins is lower in the region under discussion.

Belan Group

In the basin of the Belan and its tributary, the Seoti, the artefacts of Upper Palaeolithic tradition have been collected in two different modes. The first group comes from the old bank deposits of the rivers Belan and Seoti and the second one from the slopes of the adjoining foot-hills (*IAR*, 1968-69 : 33-34).

The first group of artefacts, which have been found *in situ* from the section belong to three different layers, *i.e.*, 5, 4 and 3. According to Sharma, layer 5 has yielded the implements of both Upper Palaeolithic and Middle Palaeolithic traditions. Layer 4, which is a 'cemented gravel III' deposit, has revealed a pure Upper Palaeolithic assemblage. Whereas, the layer 3, which is made of 'whitish clay', contains the Upper Palaeolithic tools with an aceramic non-geomatric microlithic industry. The said sequence though fascinating does not seem to be very convincing. The number of artefacts obtained *in situ* is also too small (less than 15) to support the above observation.

The other group of artefacts came from the factory sites, situated on the slopes of the adjoining hills. All the reported localities are on the southern slope of the Kaimur range (Sharma, 1968). We have selected Mundva locality for a detailed study.

So far MUNDVA (Chandva) has yielded the largest number of tools. The collection was made available to the author by the courtesy of Prof. G. R. Sharma, in the Deptt. of Ancient History Archaeology and culture, University of Allahabad. The artefacts of this industry are made of chert, and, are almost fresh. We propose to give in brief the techno-typological features of the industry without mentioning the statistical details.

There are five undetermined types of cores and twelve unclassified specimens. Besides, there are forty-one finished tools and sixty-four blanks.

The following types of finished tools have been noticed :

End-scraper	3
Burin	12
Borer	2
Scraper on core	4
Point	2
Round-scraper	3

Side-scraper	8
Backed blade	6
Big lunate	1
Total	41

Burins are in very good proportion and are made on flakes (Pl. LI. 2) on cores (Pl. LI, 4) and also on blades (Pl. LI, 1, 3, 8). The big lunate comparable to Federmesser of the European Upper Palaeolithic collections was also noticed in Bori-Beti and Shorapur Doab industries.

The blank group is formed by twenty-two flakes and forty-two blades. The following types of flakes have been noticed :

Unprepared	2
Partially prepared	5
Prepared	10
Levallois flake	5
Total	22

The mean of the size of these specimens is 45.4 mm.

In the group of blades eighteen out of forty-two are broken.

The measurements of the remaining twenty-four are as follows :

Length range—from 33 to 75 mm.
Mean of the length—47.0 mm.
Breadth range—from 12 to 23 mm.
Mean of the breadth—17.8 mm.
Thickness range—from 6 to 21 mm.
Mean of thickness—10.0 mm.

The ratio between mean of the length and breadth is 2.6 : 1 and between mean of the length and thickness is 4.7 : 1.

The blades of this region in general are longer and thinner than the similar specimens of the other regions.

Upper Son-Basin

We have already mentioned, that three different assemblages have been reported from this region. The 'Series I' and 'Series II' of the investigator have already been discussed in the chapters of the Lower and the Middle Palaeolithic. There is some difference of opinion about the 'Series III' assemblage. According to Nisar Ahmed, who has worked in the region, this 'Series III' assemblage is akin to microlithic industries of the sub-continent. They are described as non-geometric microlithic assemblages. Our observation is a bit different from that of the investigator for the reasons discussed below.

To Start with the stratigraphic position of these implements is not certain, as it has been reported that the 'Series III' or 'Late Stone Age' industries come from surface.

A number of localities of this phase have been noticed by Nisar Ahmed and the artefacts from all of them have been studied together. On techno-typological considerations a possibility may be suggested that, if not all, a few among them seem to belong to the Upper Palaeolithic phase (PL. LII). It was not possible to classify the implements locality-wise and separate the 'blade-burin' and 'Microlithic' assemblages.

The artefacts are made on minerals of the quartz group. The general size of the artefacts is smaller than those of Middle Palaeolithic phase of the region, but to a great extent the artefacts agree in size with 'blade-burin' industries of Chittoor district rather than the Late Stone Age microlithic industries. The size of the big blades of this collection is bigger than that in Vedullachervu group for the length of the blades ranges between 40 and 85 mm (mean=64.5 mm), the breadth between 15 and 41 mm (mean=25.0 mm) and thichness between 5 and 0.11 mm (mean=9 mm). The means of the length, the breadth and the thickness of Vedullachervu blades are 42 0, 19.3 and 9 mm, respectively. But size factor only cannot be regarded as a determining criterion for an Upper Palaeolithic industry.

The other group of smaller blades has the following measurements :

Length range 15 to 36 mm = Mean 25 mm
Breadth range 5 to 13 mm = Mean 13 mm
Thickness range 2 to 7 mm = Mean 7 mm

Possibly this group may be assigned to 'Late Stone Age', but the blades having above measurments may also occur in 'blade-burin' assemblages. The blades of smaller group are comparatively longer (length : breadth=2.8 : 1) than those of the other group length : breadth=2.6 : 1), but the former are thicker than the latter length : thickness=6 : 1 and 7.2 : 1 respectively).

It is interesting to note that the investigator himself did not find even a single geometric microlith in these industries. Besides, lunate is also said to be absent. The other important tool-type, backed blade, should not necessarily be regarded a microlith; for, it frequently appears in Upper Palaeolithic industries also. On the other hand, one can notice burins on blade (Pl. LII, 15, 30) a good number of steep scrapers which include mainly end-scrapers Pl. LII, 24, 25, 7) borers (Pl. LII, 4) and also a few notched scrapers, (the last one having closeness with Middle Palaeolithic tool-types). Various types of side-scrapers and retouched blades are also present. Fluted cores (Pl. LII, 1, 2) may occur in both the assemblages. All the flake types, including a good number of Levallois, occur. There are also a few primary blades which contain a few preparatory scars (Pl. LII, 28).

Though nothing can be said with certainty at present yet there is a possibility of finding full-fledged Upper Palaeolithic industry in this region.

Bore-Beti Assemblage

This collection was made available to the author in the Safdarjung Museum of the Archaeological Survey of India, by the courtesy of Shri B. K. Thapar.

This industry is made of fine grained minerals of the quarty group like chalcedony, agate, chert and jasper. The industry is not fit for a comparative study, since nobody in the Survey seems to know its location, stratigraphical position and other similar details. It has been included in the dissertation simply because of its techno-typological peculiarities. Hence, the percentages of various types have also not been calculated. The following types have been noticed in the finished tool group.

Side-scraper	50
Chopping-tool	5
Small Chopper	4
End-scraper	6
Round-scraper	2
Burin	4
Point	30
Backed blade	16
Big lunate	12
Total	129

Besides, there is diverse—a lump of stone showing a little working of indefinite nature. The 'big lunates' are made on thick flakes (Pl. LIII, 6), having one thoroughly reworked convex side at a high angle. Similar type has also been noticed in the 'blade-burin' collections from Shorapur Doab etc. There are also quite a few notched implements. The finished tool typology along with advanced retouching technique brings this industry closer to the other 'blade-burin' industries of the sub-continent.

There is quite a good proportion of cores in the assemblage. Seventeen of them have been utilised for detaching blades. Levallois and bifacial discoidal cores are also present in considerably good percentages. In both the latter groups, oval and round specimens are the most dominant types.

The group of blanks predominates the industry. About twenty of them seems to be 'waste-chips', sixty flakes and thirty blades. In the group of flakes there are ten Levallois flakes and six Levallois points. Most of the blades have been converted into finished tools. The mean of the length and breadth of the blades is 48.5 and 20.0 mm, respectively.

As mentioned earlier, scholars have only recently realised the possibility of the existence of Upper Palaeolithic phase in the Indian sub-continent, although a few industries were assigned to it even in the earlier part of this century. Naturally the details regarding its stratigraphical horizon and techno-typological peculiarities are still lacking.

We have selected seven assemblages coming from—Chittoor district, Shorapur Doab, Kurnool district, Singhbhum, Belan basin, Upper Son-basin and Bore-Beti, which may be termed as 'Upper Palaeolithic' or 'blade-burin' indusries. Except two, *viz.*, the 'Late Stone Age' of Upper Son-basin and Bori-Beti, all others have been claimed as such by the investigators themselves. Those two should also be assigned to this phase due to their techno-typological features.

It is unfortunately not possible to present a statistical comparison of these assemblages, for barring the exception of Vedullachervu (Chittoor) any other industry neither consists of a good number of artefacts nor is free from mixture. Hence only a few general observations have been made.

The main raw material used for making tools of this phase are the various types of the minerals of the quartz group, but Vedullachervu industry indicates that in some cases quartzite continued to be in use even in this phase.

There is a general preference for blades. Implements made on blades also dominate all these industries. Retouching is mostly at a high angle. Burins are not in such a good proportion as in the case of European Upper Palaeolithic industries. The percentage of burins fluctuates in all the seven above discussed assemblages. A new type 'big lunate', which is to a great extent similar to the Azilian points of European Epi-palaeolithic, makes its appearance. But it has been noticed only in three regions, *viz.*, Shorapur Doab, Bori-Beri and Belan.

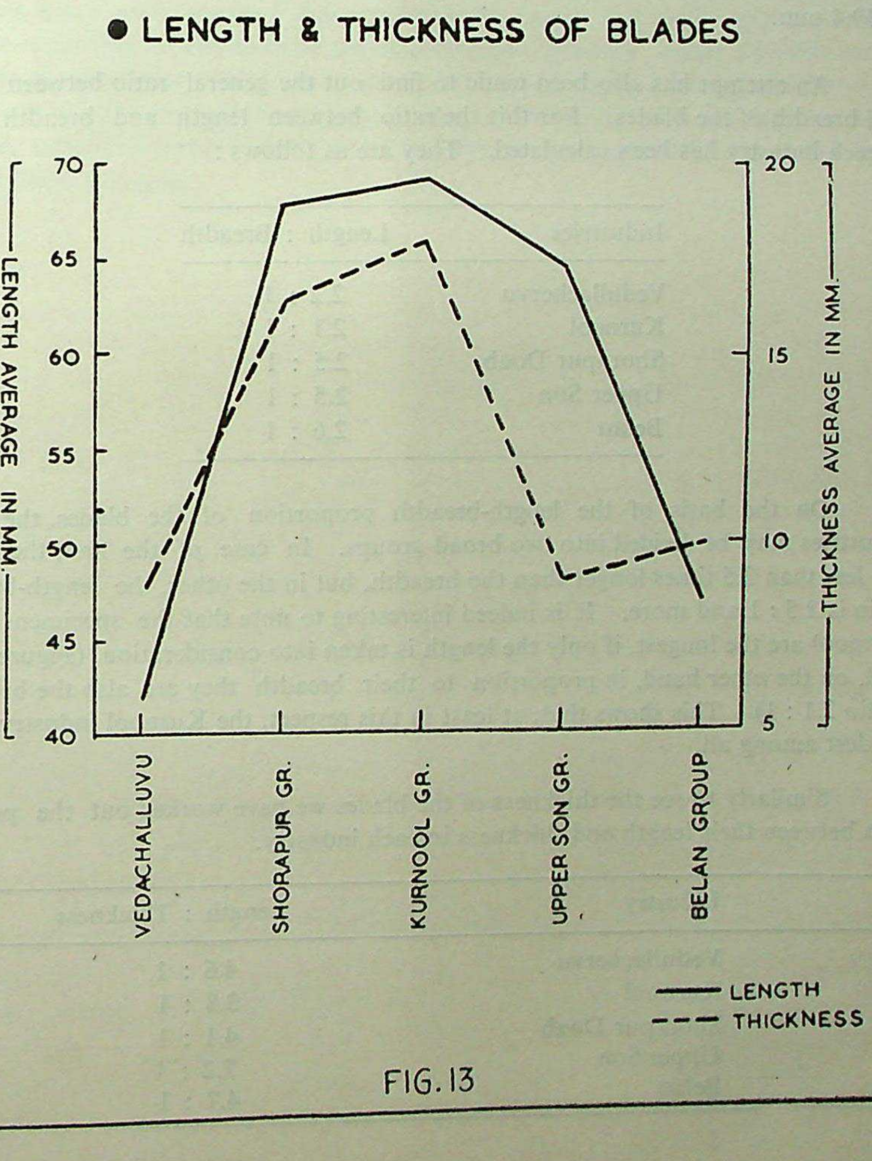


FIG. 13

As no other technological comparison is possible we have tried to compare the size proportion of the blades of various assemblages. Singhbhum and Bori-Beti assemblages have not been included for obvious reasons.

The above figure shows two curves representing length and thickness means of the blades of the five selected industries. As far length is concerned, two industries seem to belong to one group having 42.0 (VDCH) and 37 mm (Belan) as their mean, while the remaining three form another with the mean range from 54.0 to 59.4 mm.

An attempt has also been made to find out the general ratio between length and breadth of the blades. For this the ratio between length and breadth mean in each industry has been calculated. They are as follows :

Industries	Length : Breadth
Vedullachervu	2.2 : 1
Kurnool	2.1 : 1
Shorapur Doab	2.5 : 1
Upper Son	2.5 : 1
Belan	2.6 : 1

On the basis of the length-breadth proportion of the blades, the above industries may be divided into two broad groups. In case of the first, the blades are less than 2.5 times longer than the breadth, but in the other, the length-breadth ratio is 2.5 : 1 and more. It is indeed interesting to note that the specimens from Kurnool are the longest, if only the length is taken into consideration (Figure, 13), and, on the other hand, in proportion to their breadth they are also the broadest (ratio 2.1 : 1). This shows that, at least in this respect, the Kurnool industry is the crudest among all.

Similarly to see the thickness of the blades we have worked out the proportion between their length and thickness in each industry.

Industry	Length : Thickness
Vedullachervu	4.6 : 1
Kurnool	3.8 : 1
Shorapur Doab	4.1 : 1
Upper Son	7.2 : 1
Belan	4.7 : 1

The blades of Upper Son assemblage are very thin (1 : 7.2) in proportion to their length, although they are the smallest among all, if only length is taken into account (Fig. 13). The Kurnool industry, on the other hand, exhibits once more its crude technology (Length-thickness ratio—3.8 : 1). Thus, in respect of blade technology, the Upper Son and Belan are the most evolved industries, while the one from Kurnool proved itself to be the crudest.

Unlike the earlier two phases, the Upper Palaeolithic phase in India is less known, as it has only recently been recognized. Thus, not only certain basic questions regarding its geo-chronology and cultural position awaits clarification, but the material inhand is also insufficient for such studies, like the present one. Though our analysis suggest the possibility of typo-technological variations within the Upper Palaeolithic phase of this sub-continent, it is not possible to mark them with certainty at present.

CHAPTER VI

General Comparison and some Observations on Techniques

In the preceding three chapters we have tried to bring forth the technological trends within the three Palaeolithic phases of the Indo-Pakistan sub-continent. The present chapter consists of two parts. In the first, the Palaeolithic phases are compared on the basis of the various technological aspects. It was felt that such an analysis can provide clues also for understanding the history of the individual techniques. The second part is devoted to some general remarks pertaining to the various modes of blank-preparation. During the course of our study, it was realised that the statistical analyses might be able to give fruitful results which in turn, would help in finding out the various technological characteristics.

GENERAL COMPARISON

The primary aim of our comparative analyses here is to ascertain whether the industries of the Lower and the Middle Palaeolithic phases show any definite pattern with respect to technological features. As pointed out earlier the material of the Upper Palaeolithic phase was found unsuitable for such examination. In the present study the following factors will be taken into consideration.

(I) The position of various blank-detaching techniques in the two Palaeolithic phases of India;

(II) Comparative proportion of the different types of striking platforms within the two;

(III) Percentage of Mean of the angle of the various blank-types in the two phases;

(IV) Shape of flakes and their proportion in the Lower and the Middle Palaeolithic industries; and

(V) A study of the mean of size of all the blank-types of the industries of the two phases.

The discussion is based upon twenty-four selected industries—Twelve of these belong to the Lower Plalaeolithic and twelve to the Middle Palaeolithic Phases. They are as follows :

Gudiyam (GDM), Vadamadurai (VDM), Vedullachervu (VDCH), Anagwadi (ANG), Vadamanu (VMN), Nagarjunakonda-1 and 2 (NGK-1 and 2), Chirkinala

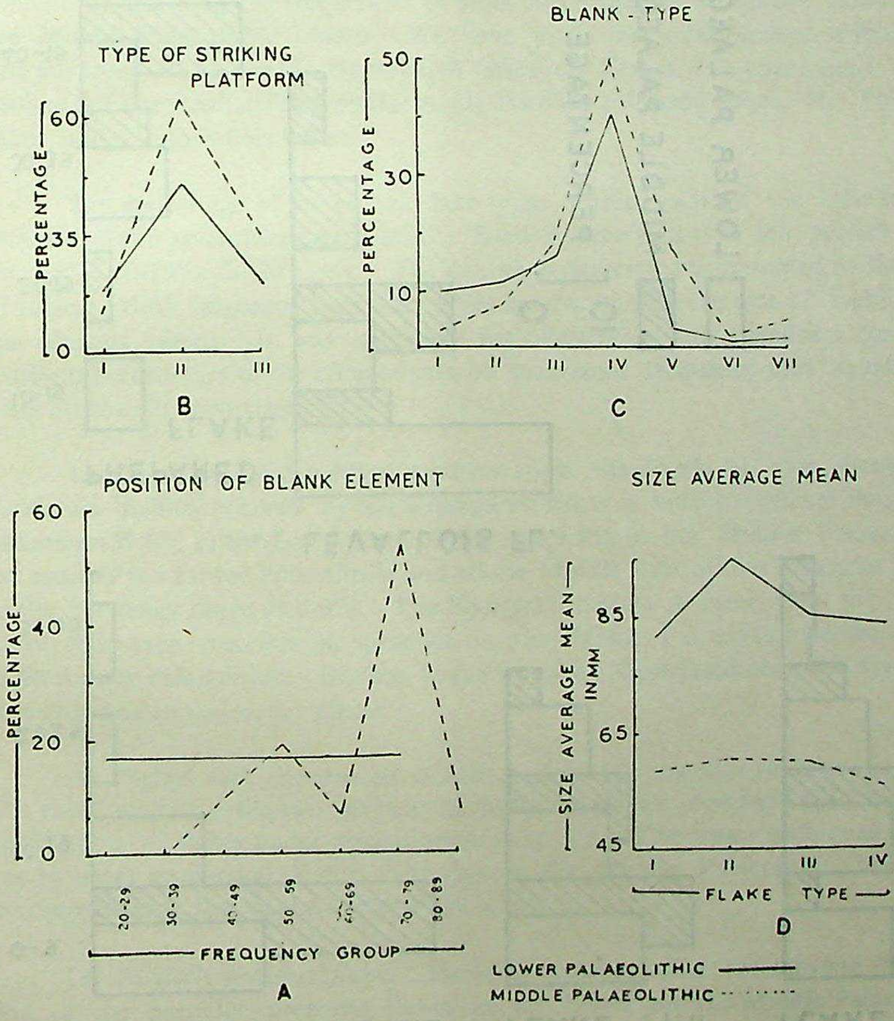
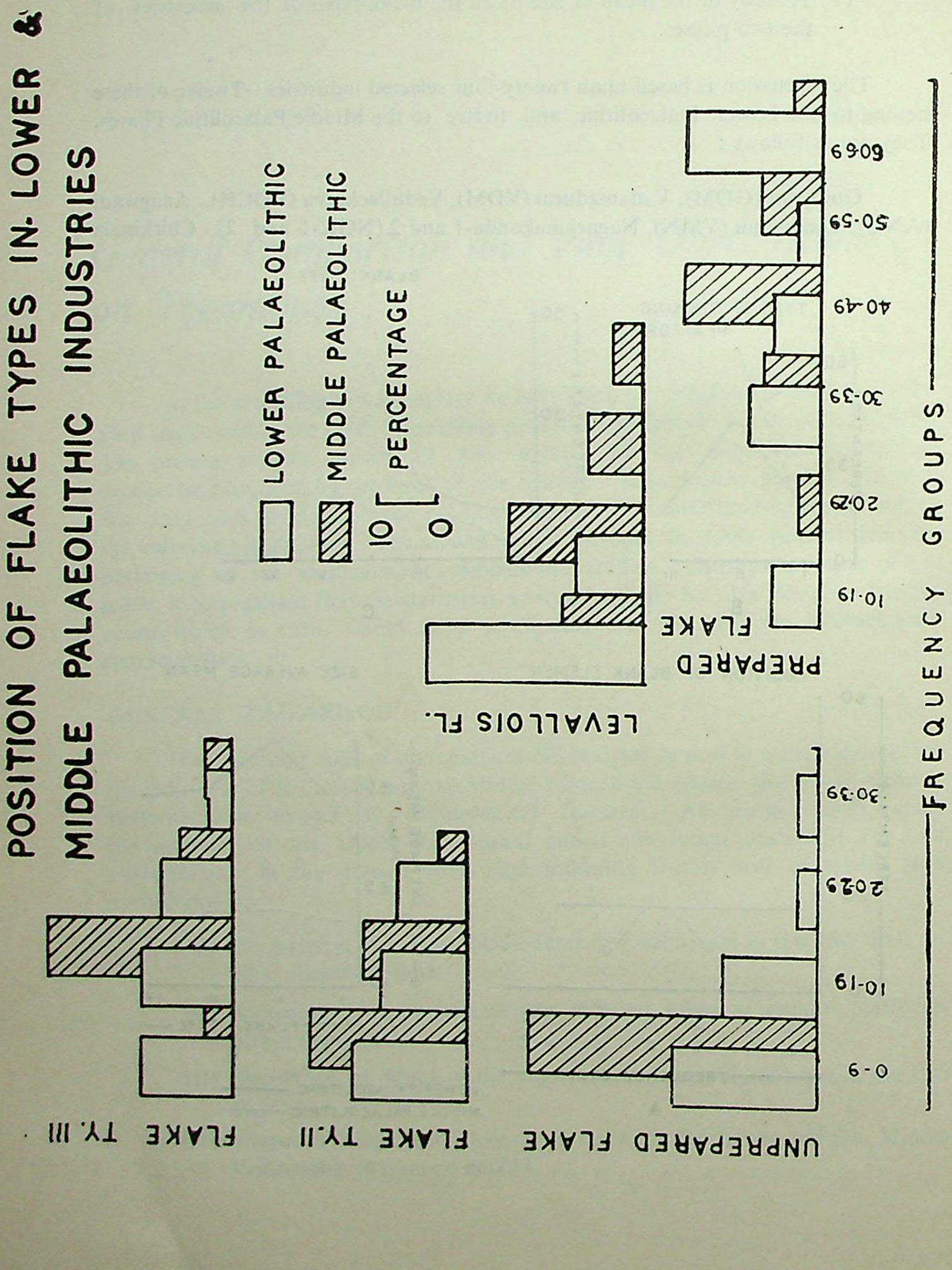


FIG. 14



POSITION OF FLAKE TYPES IN LOWER & MIDDLE PALAEOLITHIC INDUSTRIES

FIG. 15

(CHRN), Adamgarh (ADG), Mahadeo-Piparia (MPR), Lalitpur (LTP) and Bariarpur (BRP) of the Lower Palaeolithic phase, and Vedullachervu, Vadamanu, Nandipalle (NDP), Anagwadi, Kovalli (KVL), Nagarjunakonda-3, Tamakur (TMK), Adamgarh, Mahadeo-Piparia, Luni (LNI), Ramgarhwa (RMG) and Jamalpur (JMP) in the Middle Palaeolithic phase.

(*I*) *Frequency of flake-types*

The percentage of each flake-type in the selected industries has been calculated for analysing the frequencies of different techniques within the Lower and the Middle Palaeolithic phases. We have made five major groups of flakes for this purpose. These are (1) Unprepared flakes, (2) Flakes with unprepared dorsal surface but prepared striking platform, (3) Partially prepared flakes, (4) Prepared flakes, and, (5) Levallois flakes.

The percentage of individual flake-types within each of the industries is grouped within several frequency-units. Each of these unit is of ten percent value *viz.* 0-9%, 10-19%, 20-29%, etc. The data thus gathered are presented in the form of tables. Both frequency bars and curves are drawn with the aim of highlighting the obvious trends. It was necessary for illustrating the significant trends, to workout percentages of the components of individual frequency-unit against the total number of industries.

1. *Unprepared flakes* : It is apparent from the Table 10 that though the maximum points reached by the unprepared flakes in both the phases show wide variation (39.6% in the Lower Palaeolithic and 9.8% in the Middle Palaeolithic), yet most of the Lower Palaeolithic and all the Middle Palaeolithic industries belong to the frequency range of 0-9%. The Figure 15, makes it clear that the unprepared flake-type was less in practice in the Middle Palaeolithic period than in to the Lower Palaeolithic. Besides, in the valley of Nagarjunakonda the type was very common in the earlier phase.

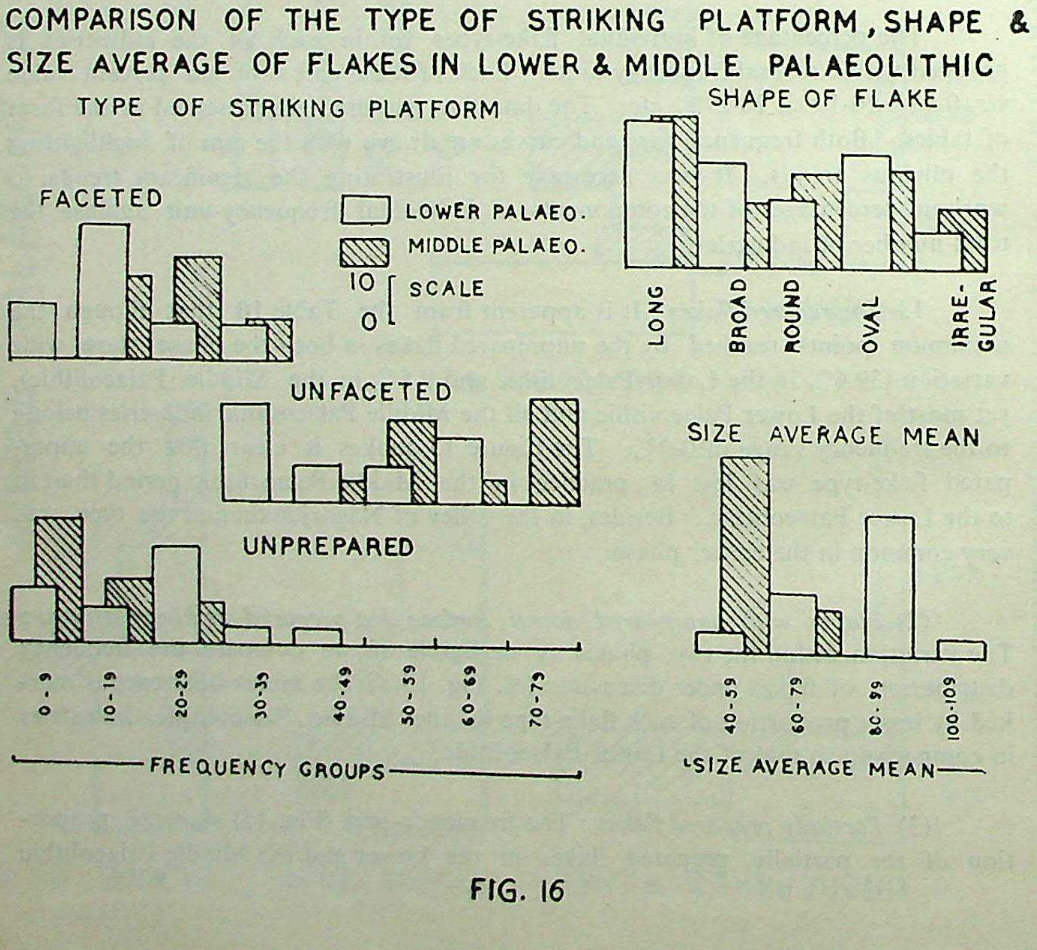
(2) *Flakes with unprepared dorsal surface but prepared striking platform* : The variation within the two phases is negligible if we compare the frequency distribution of flakes under discussion (cf. Fig. 15). The minor difference is marked by lesser proportion of such flake-type in the Middle Palaeolithic industries in comparison to that of the Lower Palaeolithic.

(3) *Partially prepared flakes* : The frequency-bars (Fig. 15) showing proportion of the partially prepared flakes in the Lower and the Middle Palaeolithic

industries reveal the following facts. The highest frequency point in the case of the Lower Palaeolithic phase (40%) is 7.5% higher than that of the Middle Palaeolithic phase (35.5%). In both the phases, most of the industries belong to the group of 10-19%.

(4) *Prepared flakes* : As is evident from the Table 10, at least in one industry of the Middle Palaeolithic phase, prepared flakes are nearly 10% more frequent that any assemblage of the Lower Palaeolithic phase. The representative groups in the two phases are those of 30-39% and 40-49% respectively.

(5) *Levallois flakes* : It is in the case of Levallois flakes that one notices striking difference between the two phases. They are certainly more frequent in



COMPARISON OF THE TYPE OF STRIKING PLATFORM, SHAPE & SIZE AVERAGE OF FLAKES IN LOWER & MIDDLE PALAEOLITHIC

FIG. 16

the Middle Palaeolithic than in the Lower Palaeolithic phase. The maximum frequency points in both the cases also vary widely, as, they are 42% in the Middle Palaeolithic and 15.1% in the Lower Palaeolithic.

Levallois points in general are very rare in all the Indian Palaeolithic phases. In the Lower Palaeolithic phase only three industries have nearly 1.9% Levallois points, and 5.3% is the maximum point reached by any industry (VDCH) in the Middle Palaeolithic phase. Similarly, blades do appear in a few industries of the Lower Palaeolithic phase but their frequency does not go beyond 6.0% (VDM). On the other hand, they range between 2.6% (VMN) and 11.9% (KRN) in the Middle Palaeolithic industries.

With a view to comparing the general frequencies of different blank types in the Lower and the Middle Palaeolithic phases, a percentage mean of each type has been calculated and presented in the form of curves (Fig. 14 C). The graph clearly shows that the cruder blank types (unprepared flakes and flakes with unprepared dorsal and prepared platform) are more frequent in the Lower Palaeolithic, whereas all the other advanced types, including the Levallois flakes, points and blades, indicate higher frequency in the Middle Palaeolithic phase. But it must be emphasized that these variations between the two are not very marked and the points of difference in frequencies hardly exceed 10%. This observation naturally leads us to conclude that the industries of the Lower Palaeolithic phase in India differ from the Middle Palaeolithic ones more on typological grounds than on technological. Of course, a few industries of both the phases are exceptions to this general observation.

(II) *Nature of Striking-Platform*

For a comparative study of the nature of striking platform of the blanks in the Lower and the Middle Palaeolithic phases, a similar statistical method has been adopted, and the results are presented in the form of Table 11 (cf. Fig. 14B).

Most of the Middle Palaeolithic industries contain a low percentage of blanks, having unprepared striking platform, while those of NGK-1 and VMN in the Lower Palaeolithic phase show considerably high proportion of such blanks. But, except for the above two industries, the Lower Palaeolithic assemblages as a rule, do not necessarily contain a high percentage of these.

The highest percentage reached by the blanks having prepared but unfaceted striking platform in the Middle Palaeolithic phase is 79.9%, which is approximately 10% higher than in the Lower Palaeolithic. Most of the Middle Palaeolithic industries fall within 70-80% group, but in the Lower Palaeolithic, the dominant group is that of 30-39%. Thus, unfaceted striking platforms of the blanks in general are more frequent in the Middle Palaeolithic phase than in the Lower Palaeolithic.

The Table 11 shows that ten out of fourteen Lower Palaeolithic industries contain less than 20.0% blanks with faceted platforms, while nine out of thirteen of the succeeding phase fall within the frequency-range of 20 to 41.7% (Fig. 16). It is a clear indication of the fact that this technique was more prevalent in the Middle Palaeolithic than in the Lower Palaeolithic phase.

In order to obtain a general comparison of all the three types of striking platforms in the Lower and the Middle Palaeolithic phases mean of the frequencies of each type has been calculated and presented in the form of curves (Fig. 14, B). The curves indicate that though the blanks with unfaceted striking platform dominate in the industries of both the phases, yet those with unprepared platform show a higher percentage in the Lower Palaeolithic while the remaining two are more frequent in the later phase.

(III) *Mean of the Angle between the striking platform and the flake surface*

The mean of the angle between the striking platform and the ventral surface of the blanks of the selected industries of the Lower and the Middle Palaeolithic phases is being presented in the form of Table 13.

The mean of the angle of the Middle Palaeolithic blanks is lower in general in comparison to those of the Lower Palaeolithic. The variation is evident firstly from the mean of the angle-range of the two, which is 107.7° to 119.6° and 93.6° to 114.1° respectively, and secondly, by the fact that most of the industries of the first phase fall in the group of 110° to 119° and those of the other in 100° to 109°. A similar difference can also be noticed in the general mean of the angle of the two phases.

(IV) *Shape of the flakes*

With the aim of studying the distribution of the shape of the flakes in the two Palaeolithic phases, we have selected only four shapes—long, broad, oval and round, all having definite ratio between their length and breadth. In Table 12 the frequency of shape in the selected industries has been mentioned.

Though the maximum frequency points reached by the Lower and the Middle Palaeolithic industries in this case show a fairly wide variation (47.6 and 60.0%), yet the variations in the representative groups in the Lower Palaeolithic are

20-29% and 30-39%, whereas in the Middle Palaeolithic it is 20-29%. (Fig. 16) The general frequency mean of the Middle Palaeolithic is a little higher than the Lower Palaeolithic (34.4% and 31.8% respectively).

If comparison were made between the maximum frequency points (Lower Palaeolithic 41.1% and Middle Palaeolithic 30%), the representative groups (20-29% in the Lower Palaeolithic and 10-19% in the Middle Palaeolithic) and also the general frequency means of the two phases (Lower-25.2% and Middle Palaeolithic 16.1%), it would appear that the broad flakes in general are more frequent in the Lower Palaeolithic than in the Middle Palaeolithic industries (cf. Fig. 16).

In respect of oval flakes also the Lower Palaeolithic industries seem to be richer than those of the Middle Palaeolithic.

It is evident from Table 14 that round flakes are more frequent in the Middle Palaeolithic phase than in the Lower Palaeolithic. If the mean of the frequencies of the blank-shapes of the Lower Palaeolithic and the Middle Palaeolithic phases are compared, it will appear that the oval and broad ones were more common in the former, while the long and round shapes were more popular among the blanks of the Middle Palaeolithic phases (Fig. 17).

(V) *Size of Flakes*

For a general comparison of flake-size in the Lower and the Middle Palaeolithic phases, the mean-size of the flakes of every selected industry has been tabulated (cf. Table 15.) (cf. Fig. 16C).

As indicated by the Table 15, the flakes of the Middle Palaeolithic industries are approximately 30 mm smaller than those of the Lower Palaeolithic industries. The same has also been presented in the Fig. 14D.

The points which emerge from the above comparative study conclusion may be noted as follows :

1. In respect of the frequency of various flake-detaching techniques the industries of the Lower and the Middle Palaeolithic phases in India do not differ widely (Fig. 14 A). However, there seems to be a general preference for cruder techniques (those of unprepared and partially prepared core) in the former and the advance ones, like the prepared core (Proto-Levallois, Levallois and blade detaching techniques), fare slightly better in the later phase. But there are some of the Lower Palaeolithic industries, like ADG, LTP, CHTP and VDM (also having

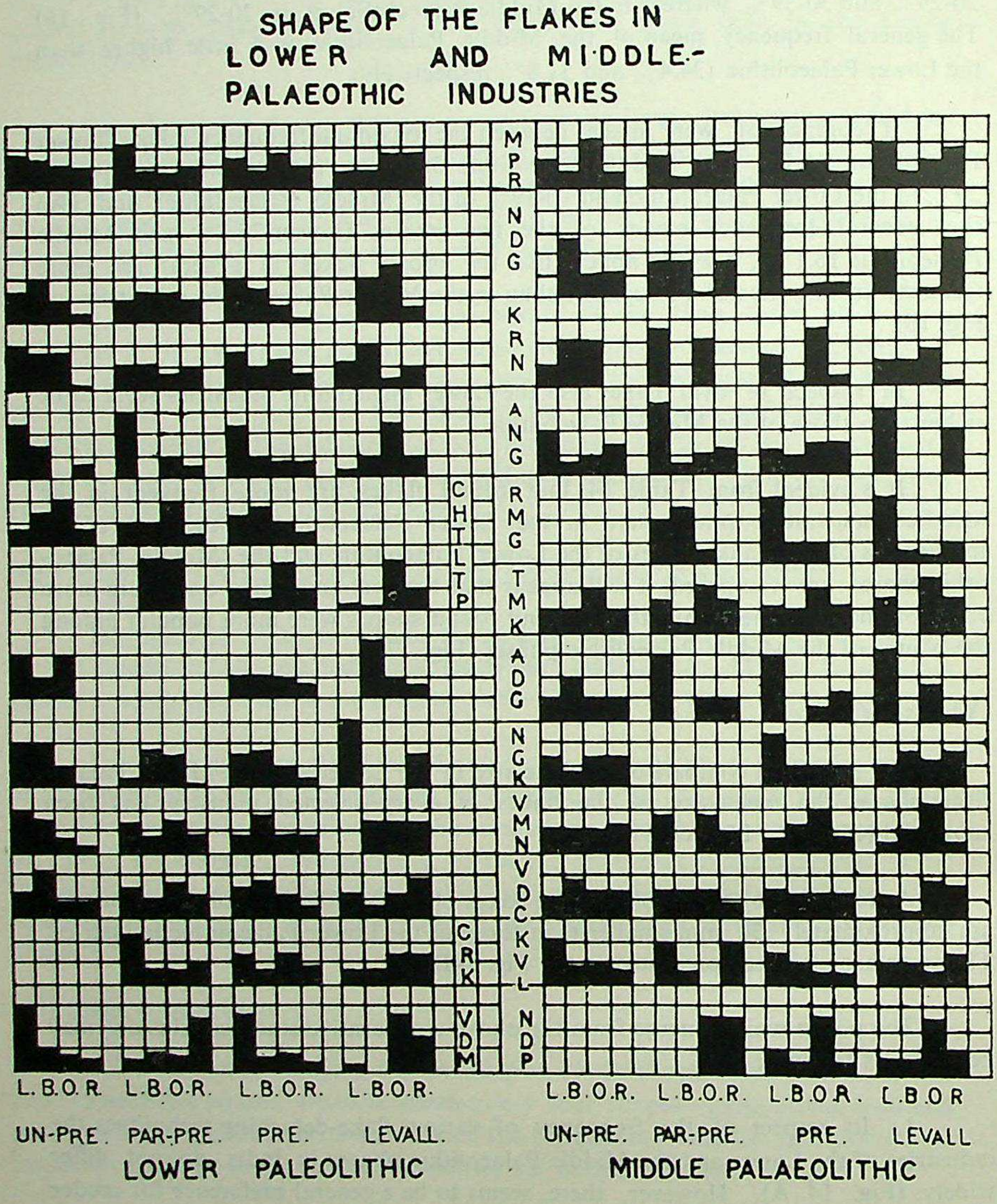

SHAPE OF THE FLAKES IN LOWER AND MIDDLE-PALAEOTHIC INDUSTRIES
MPR
NDG
KRN
ANG
RMG
TMK
ADG
NGK
VMN
VDC
KVL
NDP
CHTLTP
CRK
VDM
L.B.O.R.
L.B.O.R.
L.B.O.R.
L.B.O.R.
L.B.O.R.
L.B.O.R.
L.B.O.R.
L.B.O.R
UN-PRE.
PAR-PRE.
PRE.
LEVALL.
UN-PRE.
PAR-PRE.
PRE.
LEVALL
LOWER PALEOLITHIC
MIDDLE PALAEOLITHIC

FIG.=17

a good proportion of blades), which contain a good percentage of advance flakes-detaching techniques. Similarly, a few assemblages of the Middle Palaeolithic phase (*e.g.* ADG and ANG) have as many unprepared and partially prepared flakes as in some of the Lower Palaeolithic ones (*e.g.*, LTP, CHRN, ADG, ANG, etc.). The industries NGK-1 in the Lower Palaeolithic and RMG in the Middle Palaeolithic represent two extremes, the former predominated by unprepared and patially prepared blanks and the latter by prepared and Levallois. Barring these two extreme cases, the distinction between the two phases of the Indian sub-continent is based not so much upon technological considerations as on typological and stratigraphical (wherever available). This position is very much different from that of Europe, where the Levallois technique is one of the diagnostic traits of the Middle Palaeolithic cultures.

2. With reference to the nature of the striking platform, the two phases differ considerably. The industries of the Middle Palaeolithic phase exhibit generally a definite preference for prepared striking platform—both faceted and unfaceted. A few of the Lower Palaeolithic industries also contain a high percentage of such blanks. Between the two types of prepared striking platform, it is the unfaceted variety which is most frequent in both the phases. This means that it was a common practice to prepare the striking platform by applying one forceful stroke at a particular place, instead of carefully preparing it by detaching small chips near an end or a side.

3. The angle mean of the Middle Palaeolithic blanks is certainly lower in general in comparison to those of the Lower Palaeolithic. Is this feature related to the fact that the former contains more blanks with prepared striking platform than the later ? Our statistical analysis surprisingly indicates otherwise. The question has been dealt with in detail with reference to a few Palaeolithic industries in the second part of this chapter.

4. The tables related to various shapes of the blanks clearly indicate that the broad and oval ones are more common in the Lower Palaeolithic phase, while those of long and round shapes are some what more frequent in the Middle Palaeolithic, although all the four shapes appear in both. There are no evidence to suggest that particular shapes may be related to some of the tool-types (*e.g.*, a typical NGK-1 cleaver is made on a broad flake and most of the side-scrapers in all the industries on elongated ones). A question which needs further investigation is—what are the factors which influence the shape of a blank. To us they are shape of the parent core, its preparation, the angle of stroke given to detach the blank and the amount of force applied for the purpose (which of course is difficult to measure). Some of these aspects have been examined in the second part of this discussion.

5. In respect of the size of the blanks our analysis confirm the generally accepted view that the specimens of the Middle Palaeolithic are comparatively smaller than those of the Lower Palaeolithic phase. The difference between the general size-average mean of the two is nearly 30 mm.

SOME OBSERVATIONS ON TECHNIQUE

It is now proposed to discuss briefily about our attemps towards the understanding of the palaeo-technology using statistical analysis. One is often faced with such question as what are the factors which work for giving particular shape and size to a blank? It is known to most of us that the important among these are shape of the parent core, its preparation, the angle of stroke given to detach the blank and the amount of force applied for the purpose (which of course is difficult to measure). Some of these factors have been examined in the following paras.

The process of manufacturing a stone tool consists of three stages, *i.e.*, (a) the preparation of the core (if any), (b) detaching a major flake from the core, and (c) secondary working. This does not mean that every artefact must undergo all the three stages. It may exhibit differently the marks of one or all the three of them. Since the present dissertation aims at the study of blank-detaching technology in general and prepared core technique in particular, the first two of the above-mentioned technological stages have been our main concern.

As mentioned earlier, the different modes of core preparation also precondition the particular shapes of the blanks detached from them. By continuous experimentation over a long period, the prehistoric man gained mastery over different techniques, which besides providing desired blanks, also proved to be economical in respect of raw material.

The predetermination of a blank on its parent core depends upon the nature of the undulating surface of the latter. The negative marks left by various preparation scars form ridges on the core. It is the depressions of these scars which form weaker zones and compel the applied force (delivered for detaching the blank) to spread in a particular manner. Hence, the form and size of the blank are, in a limited way, predetermined on the surface of the parent core. One of the ways to study the role of shape, size, nature of preparation of the dorsal surface of the cores and angle of stroke, as guiding factors for the shape and size of the resultant blanks, is to analyse the relationship between the cores and the blanks of an industry in respect of the above mentioned factors.

As the cores with their detached blanks are very difficult to discover, a fruitful study can also be made of the cores and their flake-scars. Besides, the study of blanks (which are usually present in quite a good number) may also help in understanding these technological factors. We have made a case study of these points with reference to two Middle Palaeolithic industries from the Ramgarhwa factory site in the vicinity of Belan (Jayaswal and Pant, 1972).

A comparative statement of the size and shape of the cores and the flake-scars on them in the Ramgarhwa industry has been presented in the form of Tables 15.

There are only three core-types (unprepared, prepared and Levallois) which appear in a moderately good number. The general ratio between the size-average of the flake-scars and the parent core is 1 : 1.87; 1 : 1.50 and 1: 1.12 respectively. The obvious deduction from the above will be that the more thoroughly prepared a core is, the bigger a flake can be detached from it, in proportion, naturally to the size of the core. Accordingly, the Levallois is the most economical technique from the point of view of raw material.

As is apparent from the Table 16, in unprepared core group no definite pattern between the shape of the cores and those of the flake-scars is noticed. Similarly, in the next group (unprepared dorsal and prepared striking platform), both the cores are elongated but the flake-scars is long on one of them and broad on the other. The prepared cores and cores with partially prepared dorsal and prepared platform are elongated and have also yielded elongated flakes. Among the several cores of Levallois type, three are elongated, and the flake-scars on them are also of the similar shape. Besides, in one case the length-breadth ratio of the core perfectly agrees with that of its flake-scar. The other core is elongated, but the length and the breadth of the flake-scars are almost equal (1.0 : 1.08). But the remaining two cores of the industry present quite an interesting situation. Both are elongated, but the flakes detached from them are broad. This leads us to suggest that the mode of preparation of the core rather than its shape is the most important factor influencing the shape and size of the resultant flake.

In the above Figure the frequency of the various shapes distributed among the four flake-types—unprepared, partially prepared, prepared and Levallois, in Lower and Middle Palaeolithic representative industries has been presented. The round and oval shaped flakes in the Levallois group dominate in fifteen out of twenty-four industries. But such flakes in unprepared and prepared groups are predominant only in eight industries. Most of the Levallois flakes seem to be round.

Raw Material

During the course of our study it was noted that, at least in the context of the palaeolithic industries of the Indian sub-continent, raw material is the other factor which seems to have influenced the technique, the size of blanks and the angle between their striking platform and the flake surface. The form and nature of the available raw material in a particular region, *i.e.*, the size, shape and form of nodules, pebbles and blocks, along with their composition appears to be the guiding factors. Thus, if only small pebbles were available as raw material in a particular region, the prehistoric man was not in a position to make very big tools out of them. On the contrary, if big blocks of stones were to be selected for the purpose in another region, the first action of the prehistoric man for manufacturing implements would be to avail manageable flakes from them and then work them out into desired tools. The Lower Palaeolithic industries from the factory sites of the Belan-basin provide the best example of the latter. Though the Lower Palaeolithic industries in general are dominated by artefacts made on core, yet the Belan assemblages show the predominance of flakes and flake-tools. It was necessary in this case first to detach flakes from the big quartzite blocks and then convert them into finished tools or sometimes into cores for detaching desired flakes or blades.

It has also been observed that the form of the raw material influences the blank-detaching techniques. The industries of Nagarjunakonda-1 and Chirkinala (as we have seen earlier) belong to one typological group and are characterised by the predominance of cleavers, but great variation was noticed in their techniques of manufacture. In Nagarjunakonda big boulders of quartzite were available to the prehistoric man and he utilized their natural curvatures for detaching cleaver-shaped flakes (Pl. XVI, 1). But in Chirkinala, the raw material is found in the form of massive blocks, derived from dykes, which needed a thorough preparation before detaching desired cleaver-flakes. The form of the raw material thus seems to be one of the significant factors responsible for the predominance of unprepared cleaver-flakes in the Nagarjunakonda industry and of prepared and Levallois in Chirkinala.

In order to determine the influence of the composition of raw material on technology, the twelve selected industries of the Middle Palaeolithic phase[1] have been classified into three groups, *i.e.*, (i) industries containing artefacts of rough grained material (rocks—mainly quartzite), (ii) those having artefacts of both coarse and fine grained materials (rocks and minerals like chert, jasper, agate, etc.), and (iii) those consisting of tools of minerals only (Jayaswal, 1972-73 : 64-70).

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[1] The reason for selecting only the Middle Palaeolithic industries for this analysis is that they show frequent use of both coarse and fine grained materials (rocks and minerals), while the tools made of minerals are rare in the Lower Palaeolithic industries.

FREQUENCY OF LEVALLIOS & BLADE ELEMENT

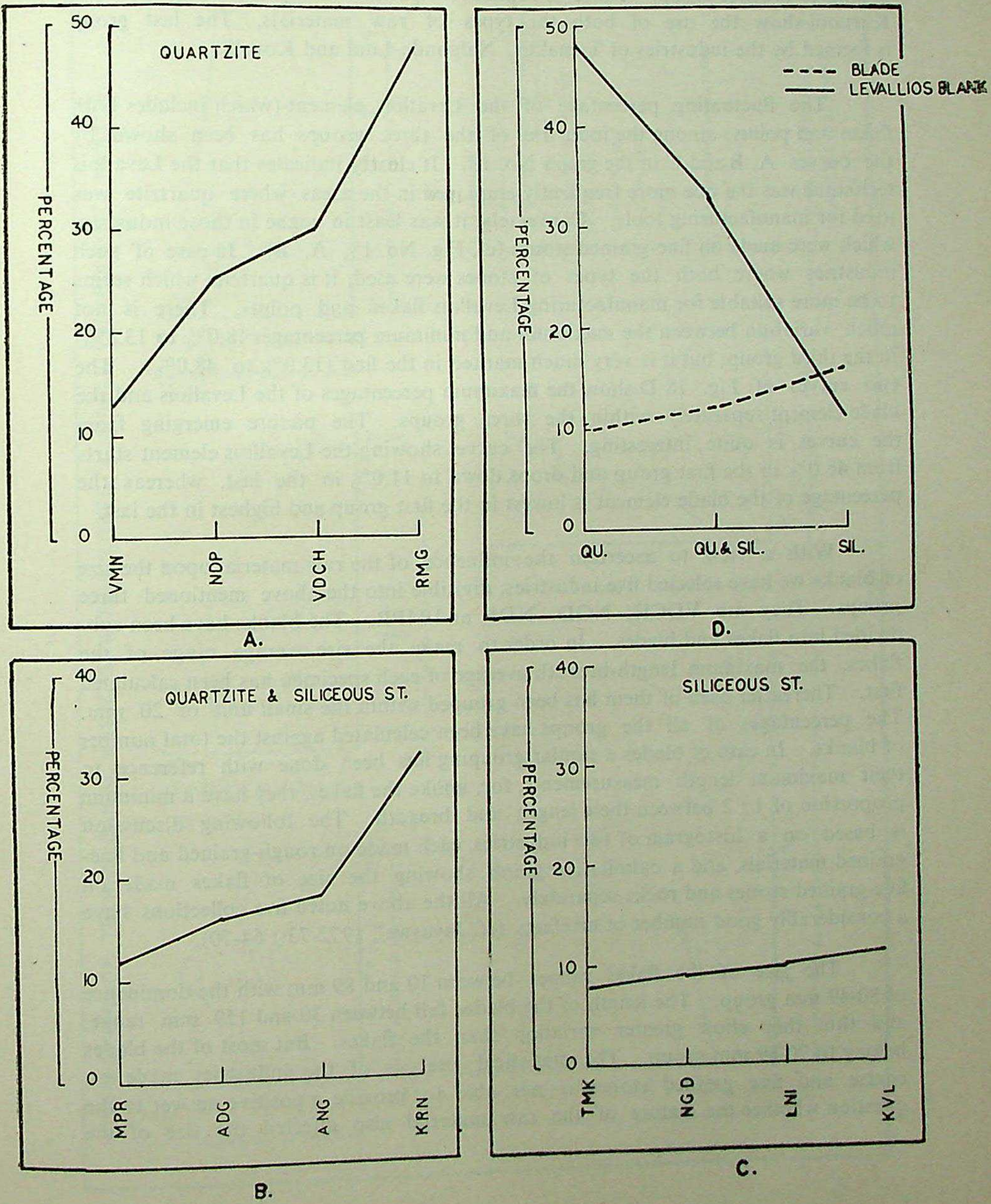

FIG. 18.

The industries of Vedullachervu, Nandipalle, Vadamanu, and Ramgarhwa belong to the first group. Those of Mahadeo-Piparia, Adamgarh, Anagwadi, and Kurnool show the use of both the types of raw materials. The last group is formed by the industries of Tamakur, Nalgonda Luni and Kovalli.

The fluctuating percentage of the Levallois element (which includes both flakes and points) among the industries of the three groups has been shown by the curves A, B and C in the graph No. 18. It clearly indicates that the Levallois technique was the one more frequently employed in the areas where quartzite was used for manufacturing tools. Conversely, it was least in vogue in those industries which were made on fine-grained stones (cf. Fig. No. 18, A, B). In case of such industries where both the types of stones were used, it is quartzite which seems to be more suitable for manufacturing Levallois flakes and points. There is not much variation between the maximum and minimum percentages (8.0% to 13.8%) in the third group, but it is very much marked in the first (13.0% to 48.0%). The two curves of Fig. 18 D show the maximum percentages of the Levallois and the blade element separately within the three groups. The picture emerging from the curves is quite interesting. The curve showing the Levallois element starts from 48.0% in the first group and drops down to 11.0% in the last, whereas the percentage of the blade element is lowest in the first group and highest in the last.

With a view to ascertain the influence of the raw material upon the size of blanks we have selected five industries, divisible into the above mentioned three groups. They are VDCH, NGD, NDP and MPR. The blanks have been subdivided into flakes and blades. In order to make the size-average range of the flakes, the maximum length-breadth average of each specimen has been calculated first. Thereafter each of them has been grouped within the small unit of 20 mm. The percentages of all the groups have been calculated against the total number of blanks. In case of blades a similar grouping has been done with reference to their maximum length measurements, for, unlike the flakes, they have a minimum proportion of 1 : 2 between their length and breadth. The following discussion is based on a histogram of two industries, each made on rough-grained and fine-grained materials, and a culmilative graph showing the size of flakes made on fine-grained stones and rocks separately. All the above noted five collections have a considerably good number of artefacts (cf. Jayaswal, 1972-73 : 64-70).

The size of the flakes ranges between 10 and 89 mm with the dominance of 30-49 mm group. The length of the blades fall between 30 and 159 mm range, and thus they show greater variation than the flakes. But most of the blades belong to 70-89 mm group. The statistical analysis of the industries made on coarse and fine grained stones is not able to provide a positive answer to the question whether the nature of the raw material also affected the size of the

COMPARISON OF TECHNOLOGICAL ASPECTS WITHIN LOWER & MIDDLE PALAEOLITHIC PHASES

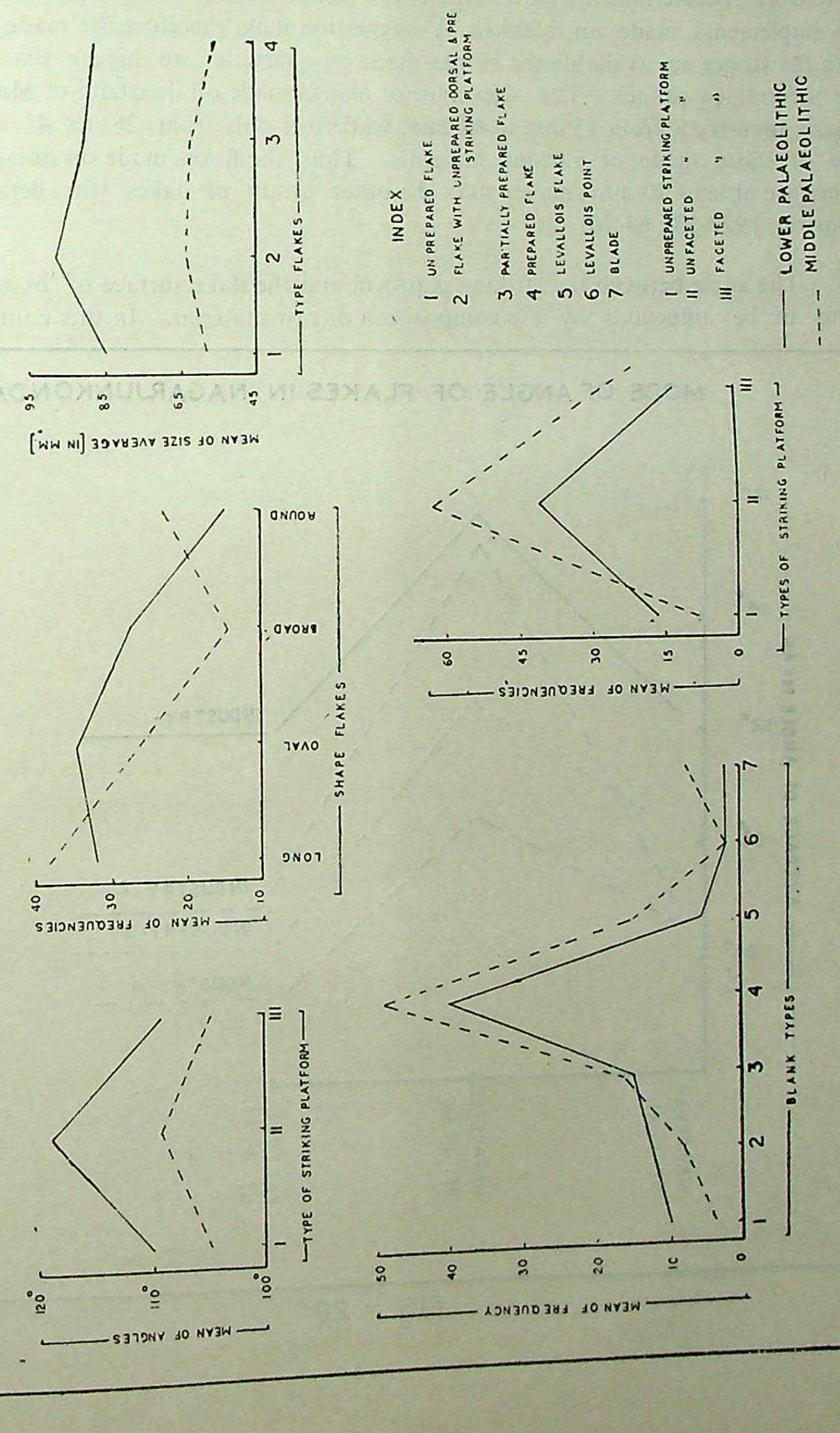

FIG. = 19

implements made on blanks. In case of Mahadeo-Piparia industry, however, the curve does indicate that the nature of the raw material has influenced the size of the implements made on blanks. A suggestion may, therefore, be made that if both the stones are available the blanks made on quartzite are bigger than those on fine-grained stones. The size-range of blanks made on quartzite of Mahadeo-Piparia industry is from 45 mm to 64 mm, while it is only from 26 to 41 mm in case of those made of various minerals. Thus the flakes made on fine-grained stones are at least 20 mm smaller than the other group of flakes (for details see Jayaswal, 1972-73 : 64-70).

The angle between the striking platform and the flake surface of blanks also seems to be influenced by the composition of raw material. In this context, an

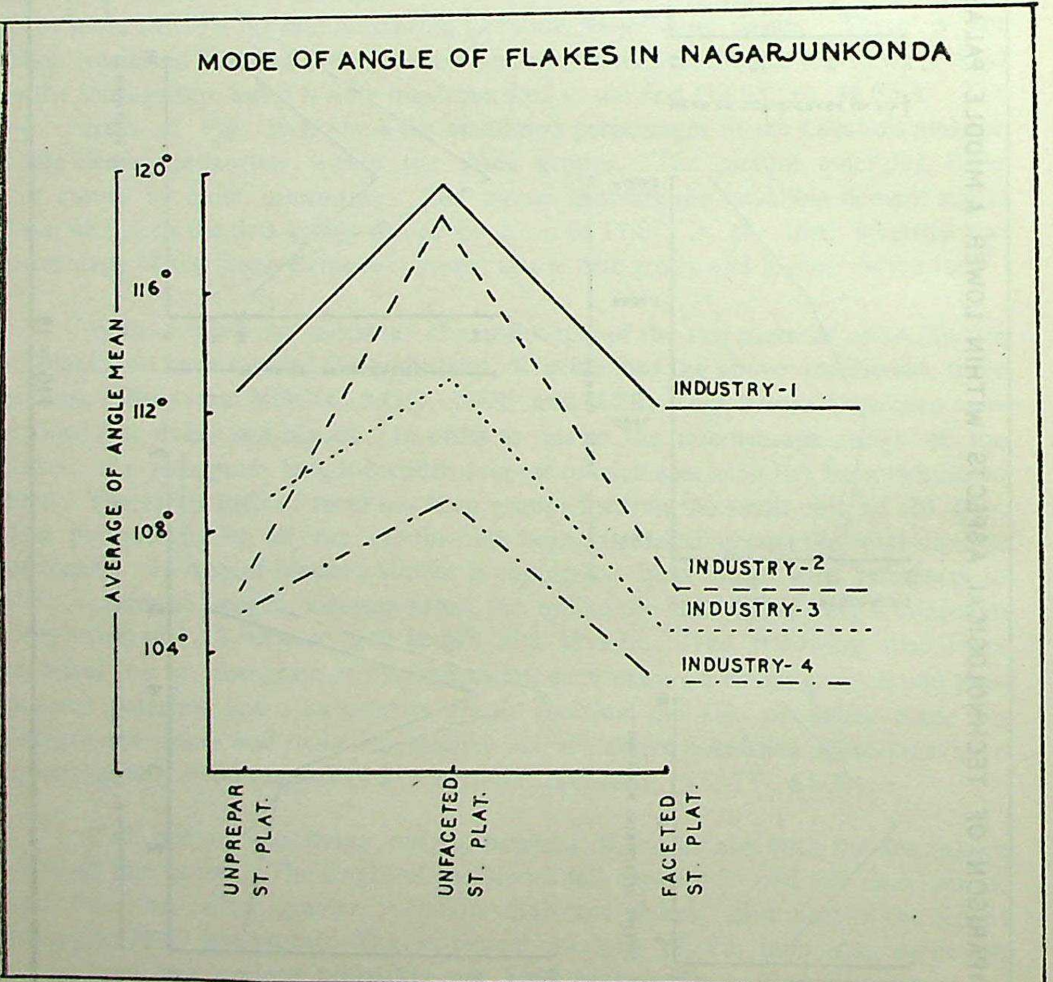

FIG. = 20

analysis of the four industries of Nagarjunakonda reveals that though the raw material used in all the four is quartzite, "yet its quality varies from one industry to the other. Thus the quartzite of industry I is coarse, that of industry II medium grained, in case of Induetry III it is medium to fine grained and the industry IV is made of fine grained quartzite only" (Pant and Jayaswal, 1971 : 368). The mean of the angle of three types of striking platforms, *i.e.*, unprepared, unfaceted and faceted, in all the four industries, when compared, shows a diminishing tendency from industry 1 to 4 (Fig. 20). Elaborating the above we have stated that the angle between the striking platform and the flake surface of the industry 1 is the highest in each group of flakes and that of the industry 4 is the lowest. It is worth noticing that the slow refinement of the angle fully agrees with the gradual betterment of the raw material selected for the industries.

On the basis of the above discussion, it may be abstracted that the nature and composition of the raw material have, influenced various technological aspects of the palaeolithic industries of India. It will be of interest to further pursue the investigation on the foresaid lines, but on much more reliable data.

TABLE 10

FREQUENCY OF BLANK TYPES

Frequency Group	Lower Palaeolithic Industries	%	Middle Palaeolithic Industries	%
Unprepared Flakes				
0— 9	GDM, ANG, CHRN, ADG, LTP	41.6		
10—19	VDM, VDCH, MPR, BRP	33.3	All	100
20—29	VMN	8.03		
30—39	NGK-1. NGK-2	16.6		
Flakes with Unprepared Dorsal Prepared ST. PL.				
0— 9	VDCH, ANG, CHRN ADG, LTP	41.6	VMN, NDP, VDCH, TMK, MPR, RMG, JMP	57.8
10—19	VDM, GDM, BRP	25.0	ANG, KVL, LNI, NGK-3	33.3
20—29	VMN, NGK-1, NGK-2, MPR	33.3	ADG	8.83
Partially Prepared Flakes				
0— 9	ANG, CHRN, ADG, LTP	33.3	VDCH, JMP	16.6
10—19	VDM, VDCH, NGK-1, MPR	33.3	NDP, ANG, KVL, NGK-3 MPR, LNI, RMG	58.0
20—29	GDM, VMN, NGK-2	25.0	TMK, ADG	16.6
30—39	BRP	8.03	VMN	8.83

Prepared Flakes

10—19	NGK-8, BRP	16.6		
20—29	VMN, NGK-2,	16.6		
30—39	VDM, ANG, LTP	25.0	ADG, RMG, JMP	25.0
40—49	VDCH, MPR	16.6	VDCH, ANG, KVL, TMK, MPR	41.6
50—59	GDM	8.3	VMN, NDP, NGK-3	25.0
62—69	CHRN, ADG	16.6	LNI	16.6

Levallois Flakes

0— 9	VDM, GDM, VDCH, NGK-1, ANG, BRP, MPR, NGK-2	75	TMK, NGK, LNI	25.0
10—19	CHRN, ADG, LTP	25	VMN, ANG, KVL, MPR, ADG	41.6
20—29	— — —	—	NDP, VDCH	16.6
30—59	— — —	—	RMG, JMP	16.6

TABLE 11

FREQUENCY OF THE NATURE OF SRIKING PLATFORM IN LOWER AND MIDDLE PALAEOLITHIC

Frequency Group	Lower Palaeolithic Industries	%	Middle Palaeolithic Industries	%
Unprepared Striking Platform				
0— 9	CHRN, ADG, LTP	25.0	NDP, NGK-3, JMP, LNI, ADG, VDCH, RMG	57.0
10—19	GDM, ANG	16.6	ANG, KVL, TMK	25.0
20—29	VDM, VDCH, MPR, BRP	33.3	MPR, VMN	16.6
30—39	VMN, NGK-2	16.6	— — —	
40—49	NGK-1	8.3	— — —	
Unfaceted Striking Platform				
30—39	VMN, ANG, LTP, BRP	33.3	— — —	
40—49	NGK-1, CHRN	16.6	VMN	8.83
50—59	VDM, MPR, NGK-2	25.0	VDCH, RMG, TMK, MPR, JMP	41.6
60—69	GDM, ADCH, ADG	25.0	ANG	8.3
70—79	— — —		KVL, NGK-3, NDP, LNI, ADG	41.6
Faceted Striking Platform				
0— 9	GDM, NGK-1, BRP	25.0	— — —	
10—19	VDM, VDCH, ANG, MPR, CHRN, ADG, NGK-2	58.3	LNI, NDP, NGK-3, KVL	33.3
20—29	LTP	8.3	ADG, ANG, MPR, RMG, TMK	41.6
30—39	VMN	8.3	VDCH, VMN, JMP	25.0

TABLE 12

DISTRIBUTION OF SHHPE OF THE FLAKES

Frequency Group	Lower Palaeolithic Industries	%	Middle Palaeolithic Industries	%
Elongated Flakes				
10—19	— — —		NDP	8.3
20—29	CHRN, VDCH; NGK-1 LTP, BRP	41.6	VMN, VDCH, TMK, NGK-3	33.3
30—39	GDM, VMN, MPR, ADG, NGK-2	41.6	KVL, LNI, JMP	25.0
40—49	VDM, ANG	16.6	MPR, ANG	16.6
50—59	— — —		ADG, RMG	16.6
Broad Flakes				
0— 9	— — —		ADG	8.3
10—19	ANG, BRP, LTP	25.0	VMN, NDP, ANG, TMK, MPR, JMP	50.0
20—29	VDM, CHRN, MPR, ADG, NGK-2	41.6	VDCH. KVL, NGK-3, RMG	33.3
30—39	GDM, VDCH, VMN	25.0	LNI	8.3
40—49	NGK-1	8.3	— — —	
Oval Flakes				
10—19	GDM	8.3	ANG, KVL, ADG, RMG, LNI	41.6
20—29	VDM, VDCH, VMN, NGK-1, MPR, ADG	50.0	VDCH, NGK-3, MPR, JMP	33.3
30—39	NGK-2	8.3	VMN, TMK	16.6
40—49	CHRN, LTP	16.6	NDP	8.3
50--64	BRP, ANG	16.6	— — —	

Round Flakes

0— 9	NGK-1, BRP, NGK-2	25.0	RMG	8.3
10—19	GDM, VDCH, VMN, ANG, CHRN, ADG, LTP	58.3	VMN, MPR, ADG	25.0
20—29	VDM, MPR	16.6	VDCH, NDP, TMK, NGK-3, LNI	50.0
30—39	— — —		ANG, KVL	16.6

TABLE 13

ANGLE-MEAN OF FLAKES IN LOWER AND MIDDLE PALAEOLITHIC

Angle Mean Group	Lower Palaeolithic Industries	%	Middle Palaeolithic Industries	%
90°— 99°	— — —		RMG, JMP	16.6
100°—109°	MPR, GDM, ANG, ADG LTP	41.6	LNI, ADG, MPR, VMN	33.3
			ANG, NGK-3, TMK	25.0
110°—119°	VDM, VDCH, VMN, NGK-1, NGK-2, CHRN, BRP	58.3	NDP, KVL, VDCH	25.0

TABLE 14

SIZE-AVERAGE MEAN OF FLAKES IN LOWER AND MIDDLE PALAEOLITHIC

Size-Average Mean Group (in mm)	Lower Palaeolithic Industries	%	Middle Palaeolithic Industries	%
40— 59	— — —		VMN, NDP, VDCH, MPR, ADG, THK, KVL, ANG, RNG	75.0
60— 79	VDM, CHRN	16.6	LNI, NGK-3, JMP	25.0
80— 99	VDCH, ANG, ADG, LTP, BRP	41.6	— — —	
100—109	GDM, VMN, NGK-1, NGK-2, MPR	41.6	— — —	

TABLE 15

RATIO BETWEEN SIZE-AVERAGE OF FLAKE-SCARS AND THE CORES

Core Types	Flake Scars : Core
Unprepared (4)	1.0 : 2.20 1.0 : 1.50 1.0 : 1.80 1.0 : 2.00
General Proportion	1.0 : 1.87
Unprepared dor. and pre. st. pl. (2)	1.0 : 1.40 1.0 : 1.50
General Proportion	1.0 : 1.45
Partially pre. dor. and pre. st. pl. (1)	1.0 : 1.80
Prepared (3)	1.0 : 1.40 1.0 : 1.60 1.0 : 1.50
General Proportion	1.0 : 1.50
Levallois (7)	1.0 : 1.08 1.0 : 1.20 1.0 : 1.10 1.0 : 1.08 1.0 : 1.09 1.0 : 1.10 1.0 : 1.20
General Proportion	1.0 : 1.12

TABLE 16

COMPARISON BETWEEN THE GENERAL SHAPE OF CORES AND THAT OF FLAKE-SCARS ON THEM

Core Types	Length : Breadth of Cores	Length : Breadth of Flake-Scars
Unprepared (4)	1.1 : 1.09	1.6 : 1.0
	2.0 : 1.00	1.5 : 1.0
	1.5 : 1.00	1.1 : 1.4
	1.5 : 1.00	1.1 : 1.5
Unpre. dor. and pre. st. pl. (2)	1.05 : 1.0	2.0 : 1.6
	1.07 : 1.0	1.0 : 1.6
Partially prepared dor. and pre. st. pl. (1)	1.3 : 1.0	1.3 : 1.0
Prepared (3)	1.5 : 1.0	1.1 : 1.0
	2.2 : 1.0	1.1 : 1.0
	1.2 : 1.0	1.2 : 1.0
Levallois (7)	1.1 : 1.0	1.1 : 1.0
	1.3 : 1.0	1.7 : 1.0
	1.2 ; 1.0	1.5 : 1.0
	1.2 : 1.0	1.0 : 1.2
	1.3 : 1.0	1.0 : 1.08
	1.2 : 1.0	1.0 : 1.2
	1.6 : 1.0	1.3 : 1.0

CHAPTER VII

Epilogue

In the preceding pages we made a modest attempt to examine intensively the position of the various blank-detaching techniques, in the Palaeolithic collections of the Indo-Pakistan sub-continent. Also, we have used statistical methods for our study, which were found quite useful. The summary of the results of our study has been briefly mentioned below :

Our analysis of the technological trends within the broad frame of typological characteristics of the Lower Palaeolithic phase of the sub-continent suggests the existence of four groups instead of the two hitherto believed cultural groups. These groups are : Pebble-tool; Pebble-tool and handaxe ; Handaxe-cleaver and Cleaver. The evidence for recognising these as separate cultures is lacking. Our study on the other hand, clearly indicates that the earlier theory of the two culture-groups in the sub-continent needs re-examination.

The published material on the Indian Middle Palaeolithic gives the impression that there is some typo-technological uniformity within the components of Middle Palaeolithic phase. Though quite a few scholars have hinted at the possibility of finding regional variations within the Middle Palaeolithic phase of the Indian sub-continent (Sankalia, 1965 and Rao 1968-69, yet no serious attempt has so far been made in this direction. While analysing the industries of the Middle Palaeolithic phase, quite a few typological as well as technological variations were noticed. In fact, we could mark at least one area having a separate cultural tradition. This area comprises the hilly part of the Southern Uttar Pradesh and the adjoining region of Bihar. The representative collections, respectively, from Ramgarhwa and Jamalpur, are noteworthy for their distinct typo-technological characteristics. Besides including the various types of side-scraper, the collections show noteworthy occurrences of knife, notched and denticulated tools. We feel that the tendency to notch the implements along with denticulated-tools is as in Europe, one of the important trends of the Palaeolithic culture of this region. The area under discussion is also rich in the presence of Levallois element. There is every probability that these marked features had a wider distribution in the Middle Palaeolithic India.

In the light of this it may be suggested that a detailed investigation of the various regions might help in demarcating the long-awaited regional variations and cultural trends within the Middle Palaeolithic phase of this sub-continent.

The Upper Palaeolithic collections from the sub-continent contain evidence of almost all the hitherto known techniques, including Levallois, but the blade detaching technique predominates. The cores prepared for the last named are mostly prismatic and rarely pyramidal. A comparative analysis of the blade element in the Upper Palaeolithic material revealed that the Upper Son and Belan are the most evolved assemblages, while those from Kurnool proved to be the crudest.

The comparisons between the Lower and the Middle Palaeolithic industries with regard to certain technological aspects reveal the following points. In respect of frequency of the various flake-detaching techniques the position is that though, there seems to be a general preference for cruder techniques in the Lower Palaeolithic and advanced ones in the Middle Palaeolithic yet the industries of the two phases do not differ widely. We may thus conclude that the existing distinction between the two phases of the Indian sub-continent is based not so much upon technological grounds as on typological and stratigraphical grounds. In comparison to the Lower Palaeolithic phase, the Levallois element fares better in the later phase. But the variation of the Levallois element in between the two in this sub-continent is not so striking as one finds in the European context.

The Palaeolithic people of the Indian sub-continent preferred to prepare the striking platform by applying one forceful stroke at a particular place instead of carefully preparing it by detaching small chips near an end or a side. For, unfaceted, striking platform is the most frequent type in both the Lower and the Middle Palaeolithic phases. A close examination reveals that the nature of striking platform with regard to the two phases differ considerably. This is due to the fact that in the Lower Palaeolithic unprepared striking platform is comparatively frequent than those found in the Middle Palaeolithic. On the otherhand, the prepared platforms (both unfaceted and faceted) are more common in the Middle Plaeolithic than the Lower.

The mean of the angle between the striking platform and the flake surface of the Middle Palaeolithic blanks is certainly lower in general in comparison to those of the Lower Palaeolithic. Is this feature related to the fact that the former contains more blanks with prepared striking platform than the latter? Our statistical analyses surprisingly indicate otherwise. This aspect was examined in the four industries of Nagarjunakonda, which are made on quartzite of rough to fine grain. Here, it was noticed that the slow refinement of the angle between the striking platform and the flake surface fully agrees with the gradual betterment of the raw material selected for the industries. Besides the mean of angle distribution in all the four industries has a uniform pattern, *viz.*, unfaceted platformed specimens having the widest-angle and only a little angle variation between the unprepared and the faceted platformed specimens. Thus, it may be possible to suggest that the angle of stroke to be delivered was conditioned by the nature of the raw matertal rather than that of the striking platform.

In respect of the size of the blanks, our analyses confirm the generally accepted view that the specimens of the Middle Palaeolithic are comparatively smaller than those of the Lower Palaeolithic phase.

A comparative study of the mean of the size-average of cores and the flake-scars on them suggested that the more throughly prepared a core is, the bigger the flake that can be detached from it, in proportion, naturally, to the size of the core. Thus, it was found that among the flake-detaching techniques Levallois is the most economical in respect of raw material. It was also noticed that the final products of this technique are generally oval or round shaped. Besides, we can also suggest that the mode of preparation rather than the shape of the core was the important factor which influenced the shape and size of the resultant flake.

Our study revealed that the form, nature and composition of the raw-material had considerable influence over the blank-detaching techniques. While most of the Lower Palaeolithic industries in the Indian sub-continent are dominated by implements made on cores or lumps, there are a few exceptions, wherein implements made on flakes are dominant. Noteworthy among these are the factory sites in the Belan region. The desired raw material in this region was available in the form of big blocks of quartzite. It was necessary in this case first to detach flakes from the huge lumps and then to convert these manageable pieces into finished tools. We also found cores for detaching flakes and blades, which were made initially on flakes.

It has also been observed that the form of the raw material influenced the blank-detaching techniques. The industries of Nagarjunakonda-1 and Chirkinala (as we have seen earlier), belong to one typological group and are characterised by the predominance of cleavers, but a vast variation was noticed in their technique of manufacture. In Nagarjunakonda big boulders of quartzite were available to the prehistoric man and he utilised their natural curvatures for detaching cleaver-shaped flakes. But in Chirkinala locality the raw material is found in the form of massive blocks, derived from dykes, which needed a thorough preparation before detaching the desired cleaver-flakes. The form of raw material thus seems to be one of the significant factors responsible for the predominance of unprepared cleaver-flakes in Nagarjunakonda industry and those of prepared and Levallois in Chirkinala for the same purspose.

Another interesting observation made during our study regarding the influence of raw material on technique is that the Levallois technique was much more frequently employed in the areas where quartzite was used for manufacturing tools. Conversely, it was least in vogue in those industries which were made on fine-grained stones. In the case of industries where both the stones were used, it is quartzite which seems to be more suilable for manufacturing Levallois flakes and points.

The present work examines various aspects of Palaeo-technology of India, with the help of statistical methods. It is apparent from our study that by making an extensive use of statistical methods and by detailed examination of the actual position of various techniques a much clearer picture of the Indian Palaeolithic cultures emerge.

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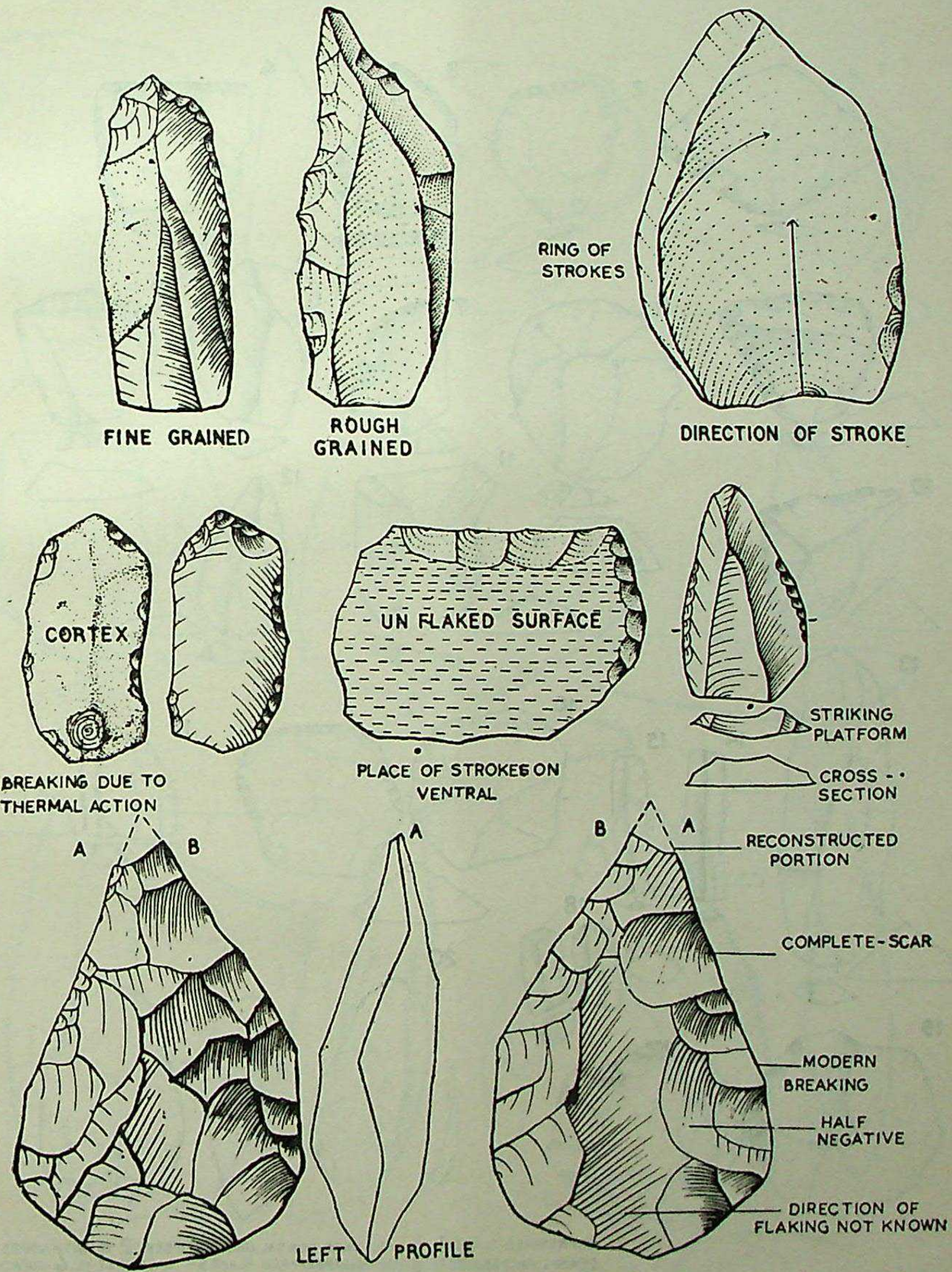
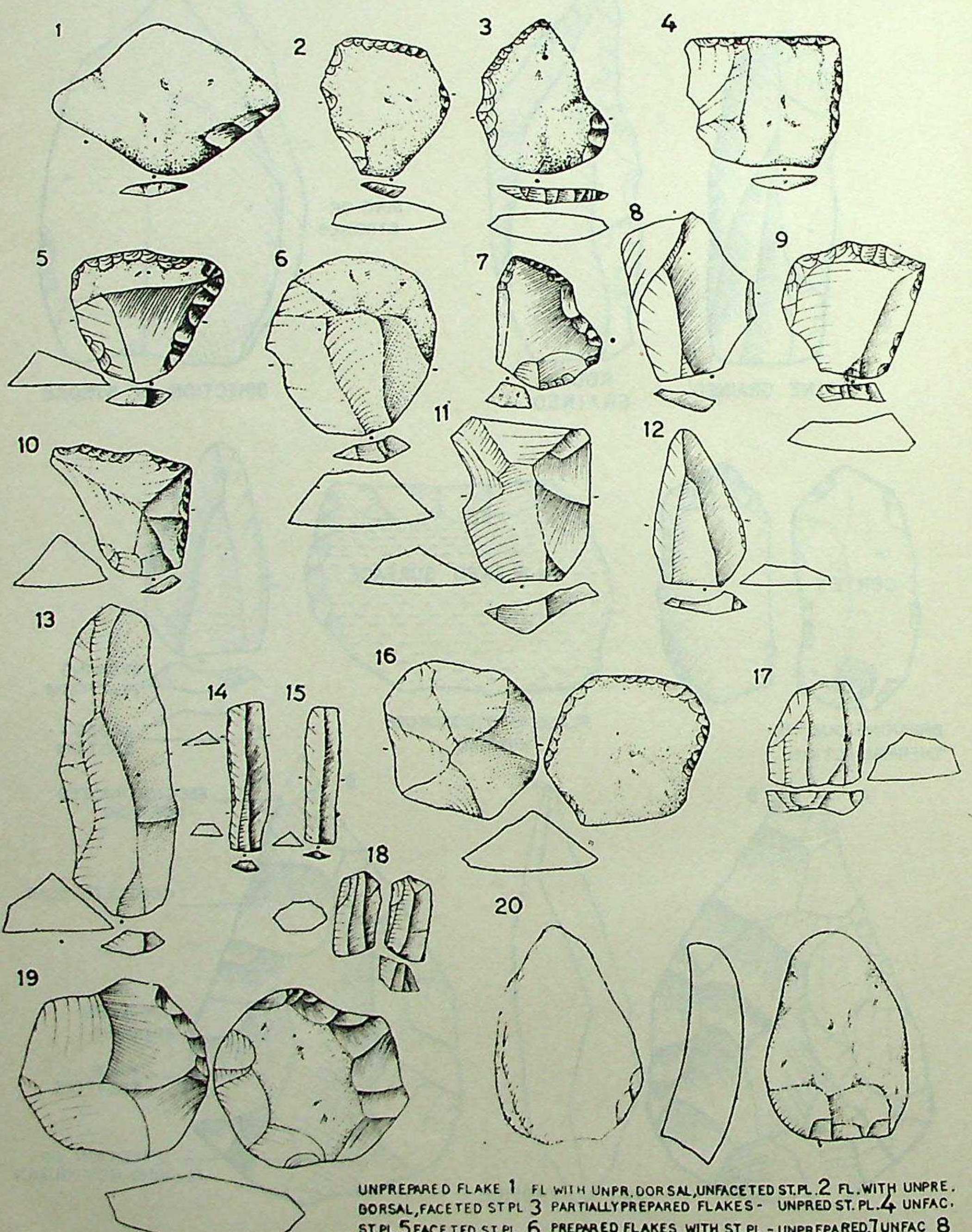
PLATES

SYMBOLS USED FOR DRAWINGS


FINE GRAINED
ROUGH GRAINED
RING OF STROKES
DIRECTION OF STROKE
CORTEX
BREAKING DUE TO THERMAL ACTION
UN FLAKED SURFACE
PLACE OF STROKES ON VENTRAL
STRIKING PLATFORM
CROSS - SECTION
A
B
A
B
A
RECONSTRUCTED PORTION
COMPLETE-SCAR
MODERN BREAKING
HALF NEGATIVE
DIRECTION OF FLAKING NOT KNOWN
LEFT PROFILE

Pl-II



UNPREPARED FLAKE 1 FL WITH UNPR. DORSAL, UNFACETED ST. PL. 2 FL. WITH UNPRE.
DORSAL, FACETED ST PL 3 PARTIALLY PREPARED FLAKES - UNPRED ST. PL. 4 UNFAC.
ST. PL. 5 FACETED ST PL 6 PREPARED FLAKES WITH ST. PL. - UNPREPARED, 7 UNFAC 8
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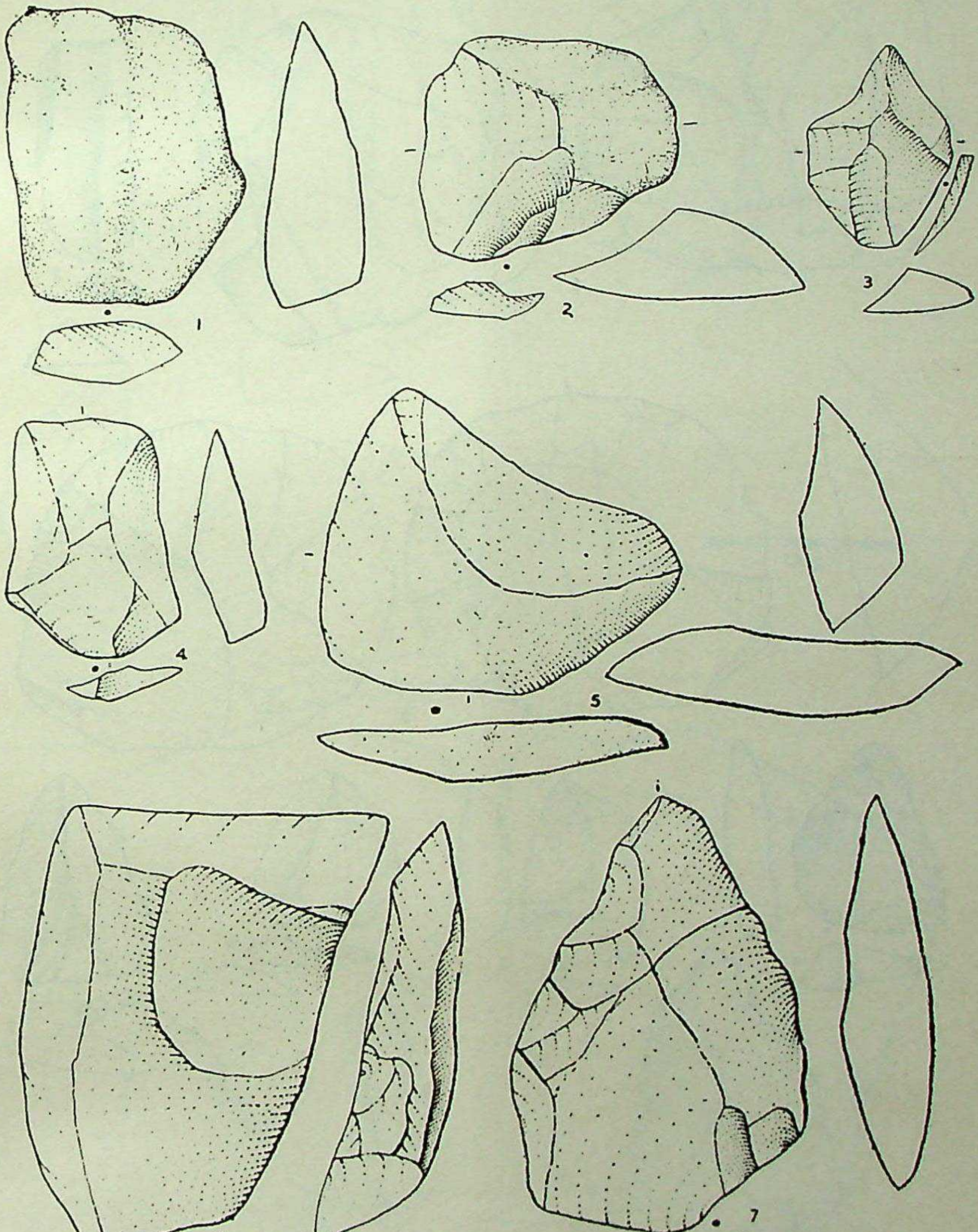
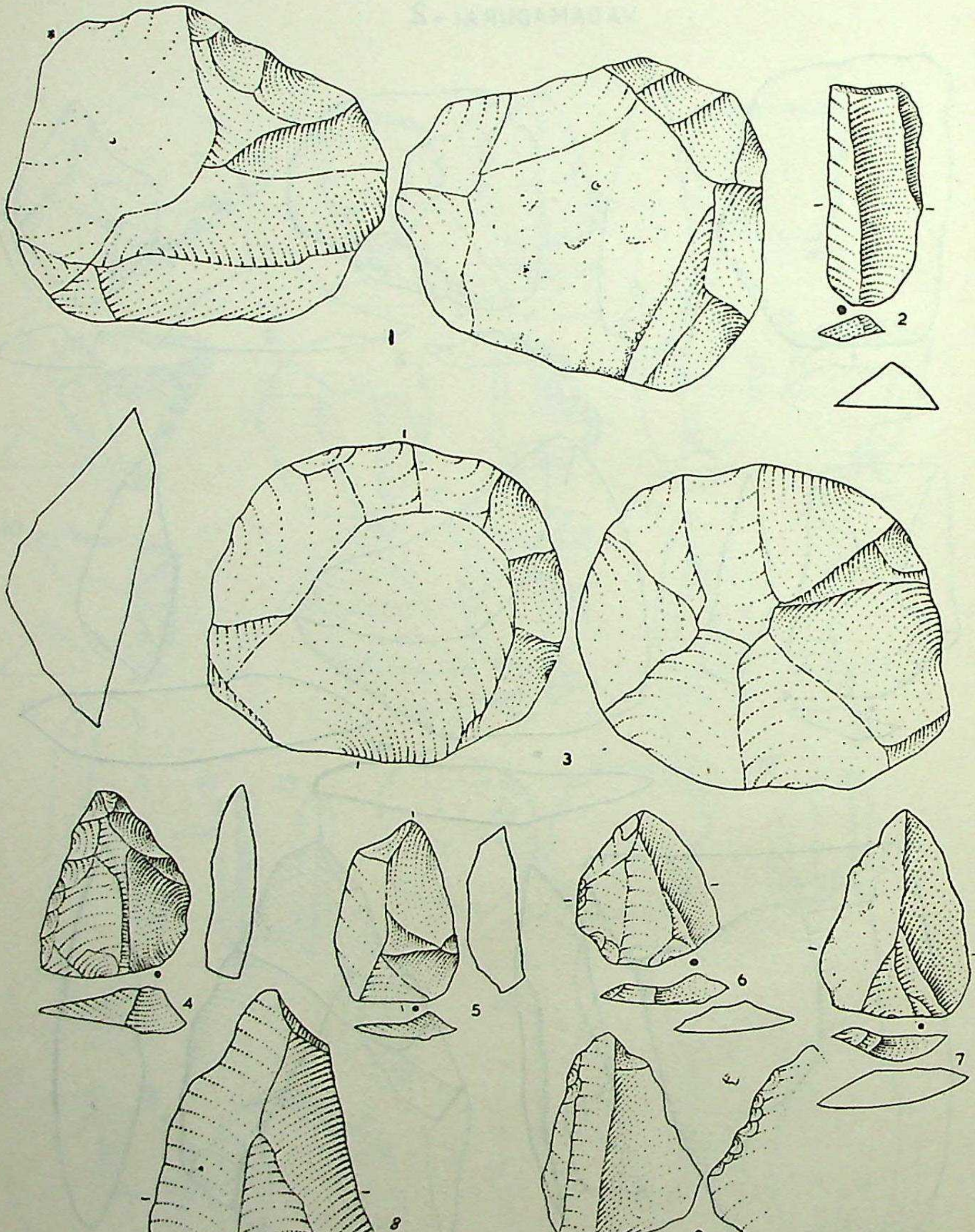
VADAMADURAI -2



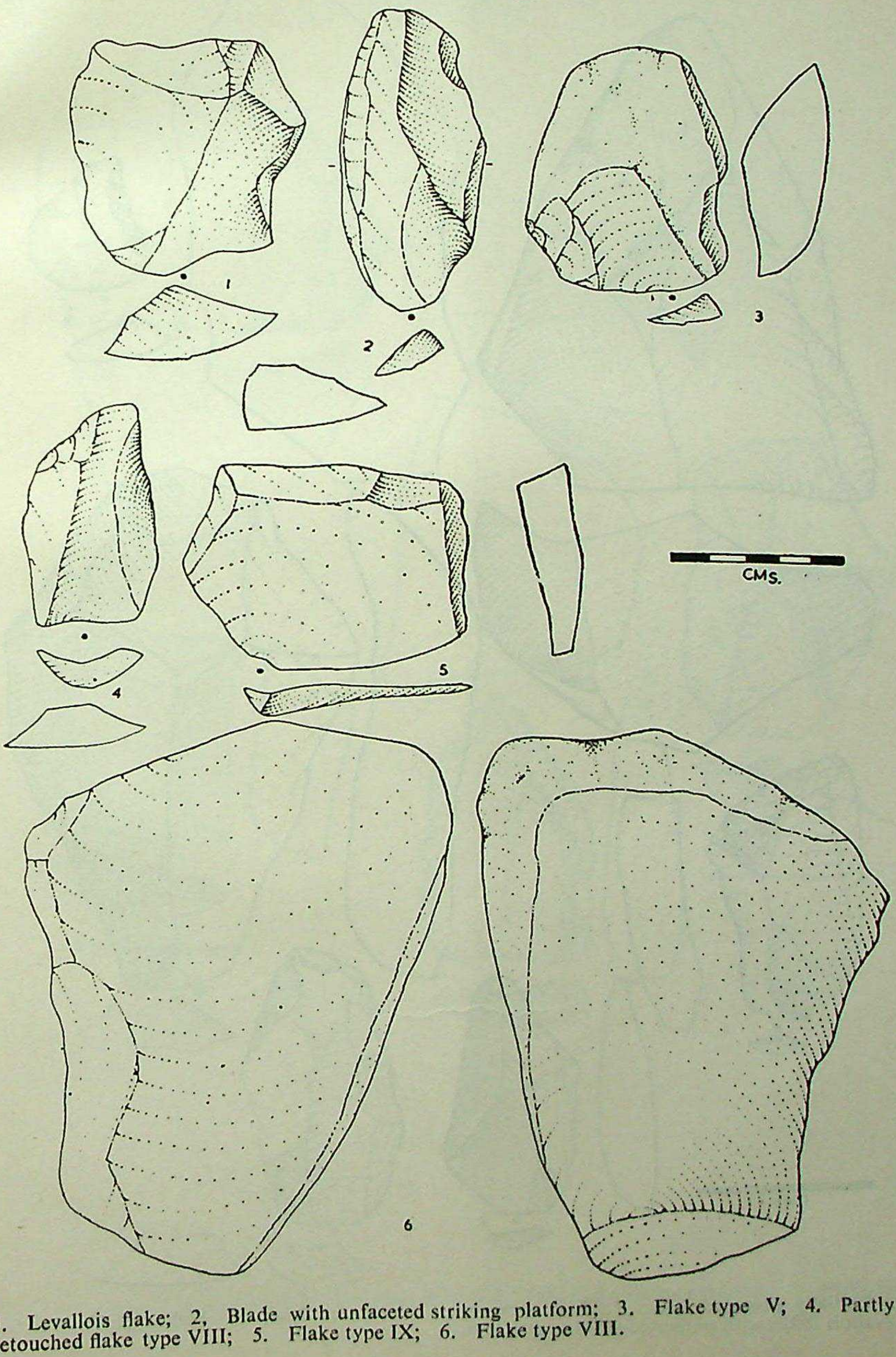
1. Flake type III; 2. Flake type IV; 3 & 4. Levallois flake with unfaceted striking platform; 5. Flake type VII; 6. Partially retouched flake-type VIII; 7. Side scraper on flake type VIII.

VADAMADURAI-2

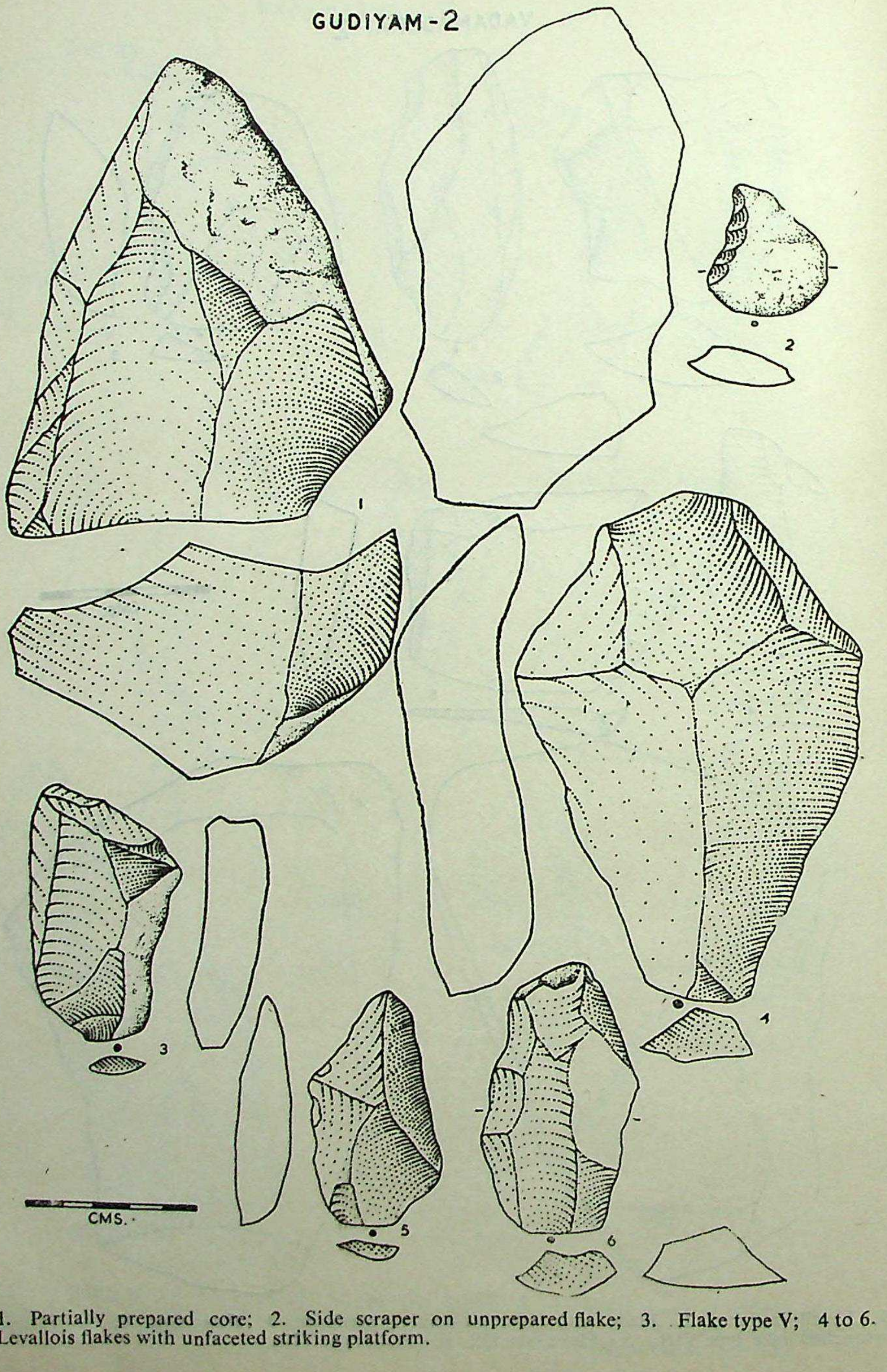


1. Prepared core made on flake type II; 2. Broken blade; 3. Levallois core; 4. Point on flake type IX; 5. Levallois flake with unfaceted striking platform; 6. Partially retouched Levallois point. 7. Flake type VI; 8. Levallois point; 9. Side scraper on flake type VIII.

VADAMADURAI-2

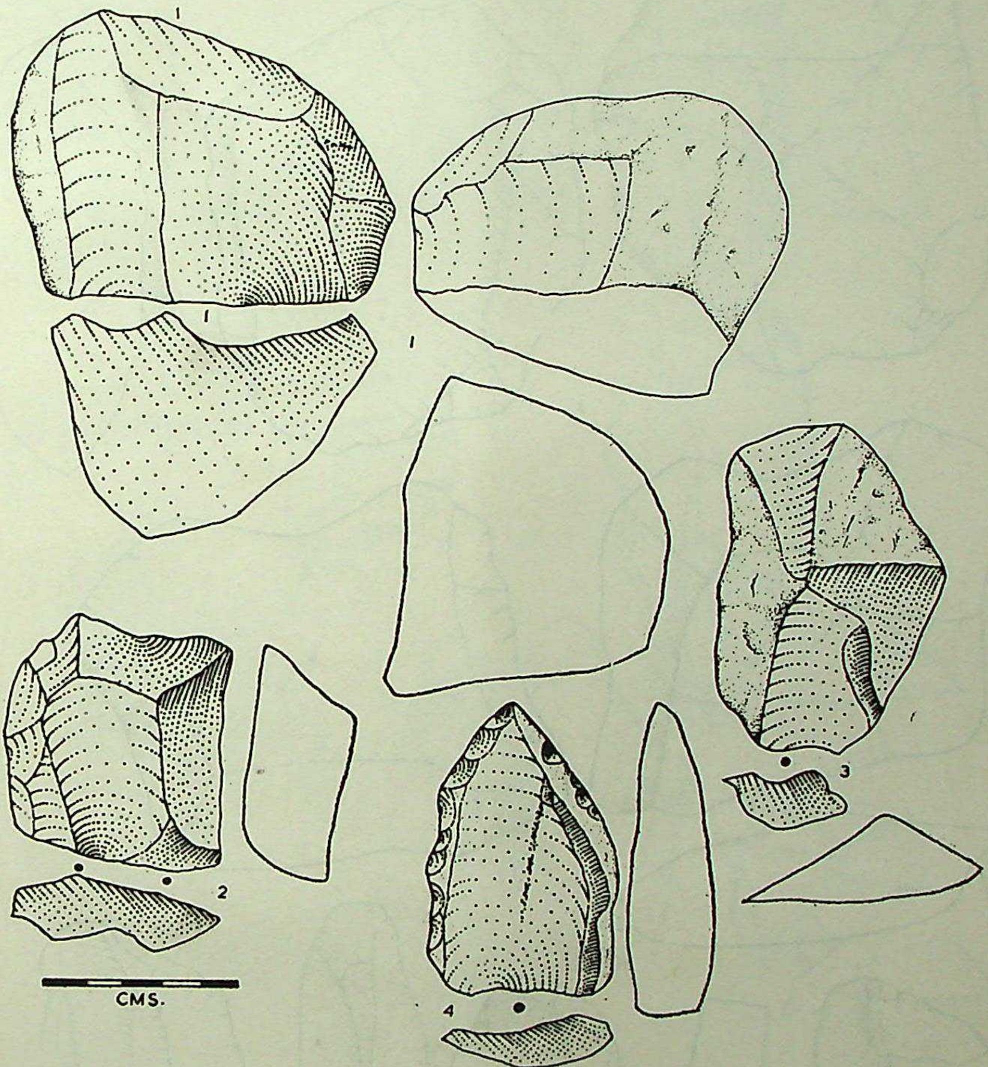


1. Levallois flake; 2, Blade with unfaceted striking platform; 3. Flake type V; 4. Partly retouched flake type VIII; 5. Flake type IX; 6. Flake type VIII.


GUDIYAM-2
1
2
3
4
5
6
CMS.

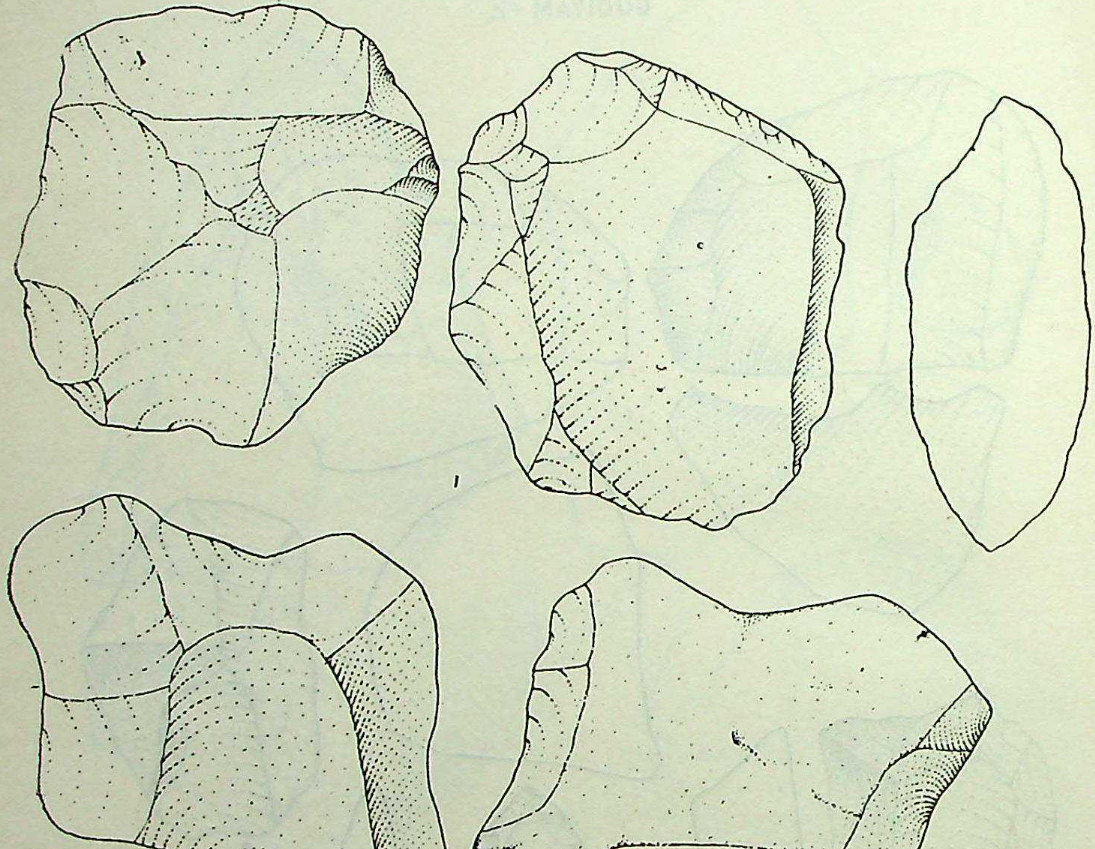
1. Partially prepared core; 2. Side scraper on unprepared flake; 3. Flake type V; 4 to 6. Levallois flakes with unfaceted striking platform.

GUDIYAM - 2



1. Partially prepared core; 2. Levallois flake with unfaceted striking platform; 3. Flake type V;
4. Flake type VIII.

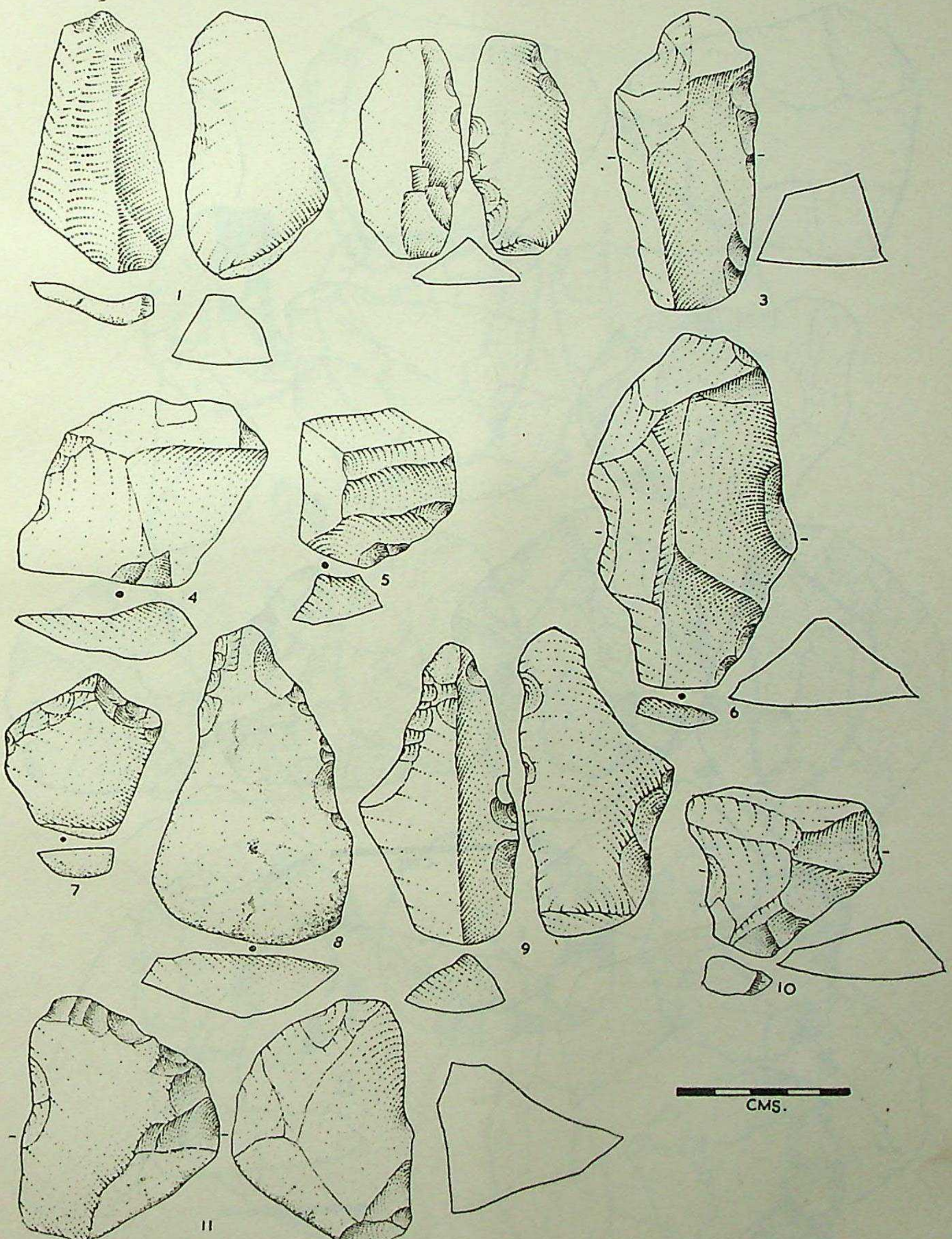
GUDIYAM -3



1. Levallois core; 2. Prepared core; 3. Levallois flake; 4. Side-scraper on Levallois flake; 5. Blade with unfaceted striking platform; 6. Flake type VIII.

Pl.-IX

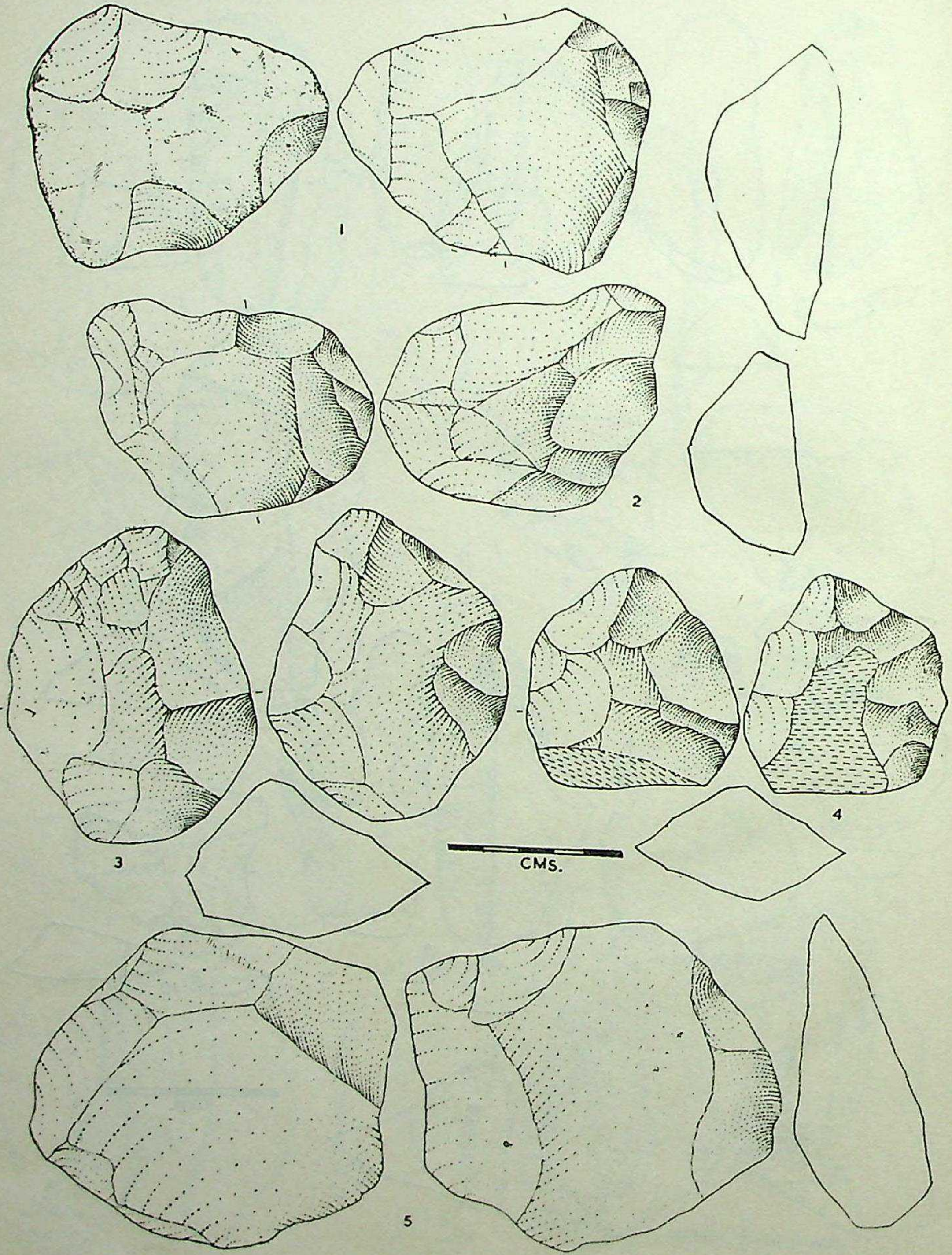
VEDULLACHERVU



1. End-scraper on Levallois flake; 2. Blade with marginal retouch; 3. Blade detached from Levallois flake core; 4. Partially retouched Levallois flake; 5. Partially retouched flake type VIII; 6. Partially retouched Levallois flake; 7. Point on flake type VII; 8. Partially retoushed flake type II; 9. Side-scraper on flake type VIII; 10. Levallois flake; 11, Scraper on nodule.

Pl.-X

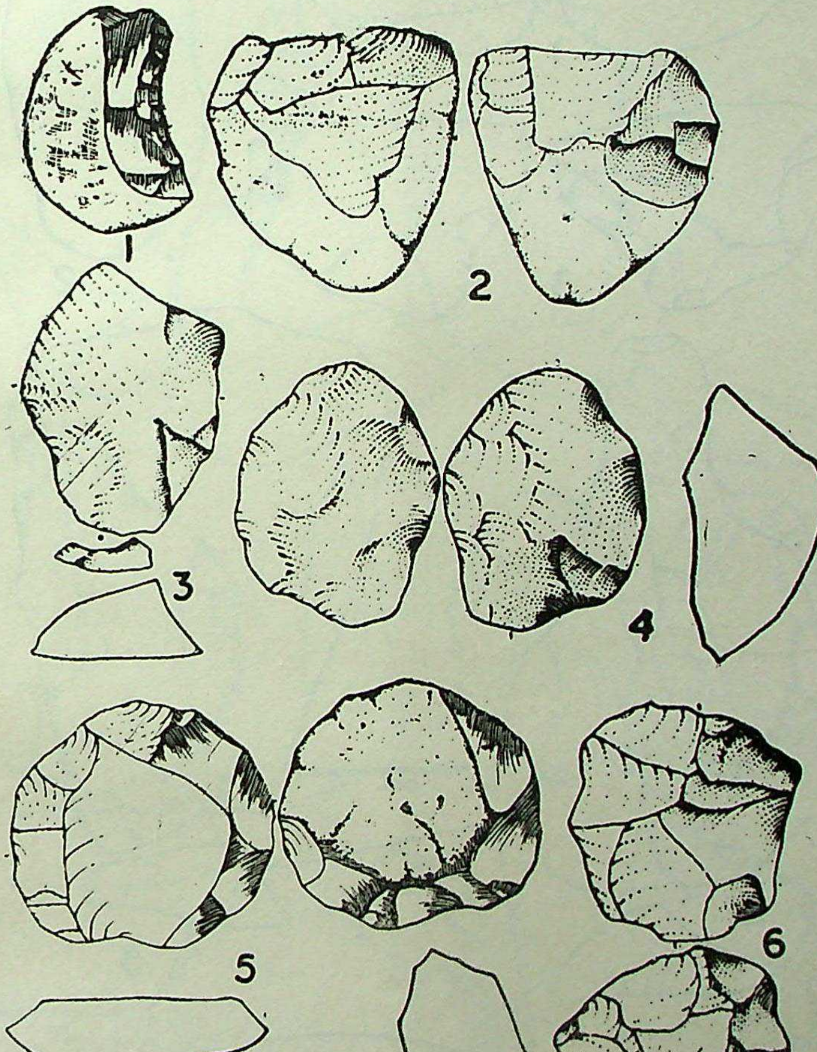
VEDULL ACHRVU



1. Levallois core with partly prepared striking platform; 2. Levallois core; 3. Levallois core; 4. Prepared core; 5. Levallois core.

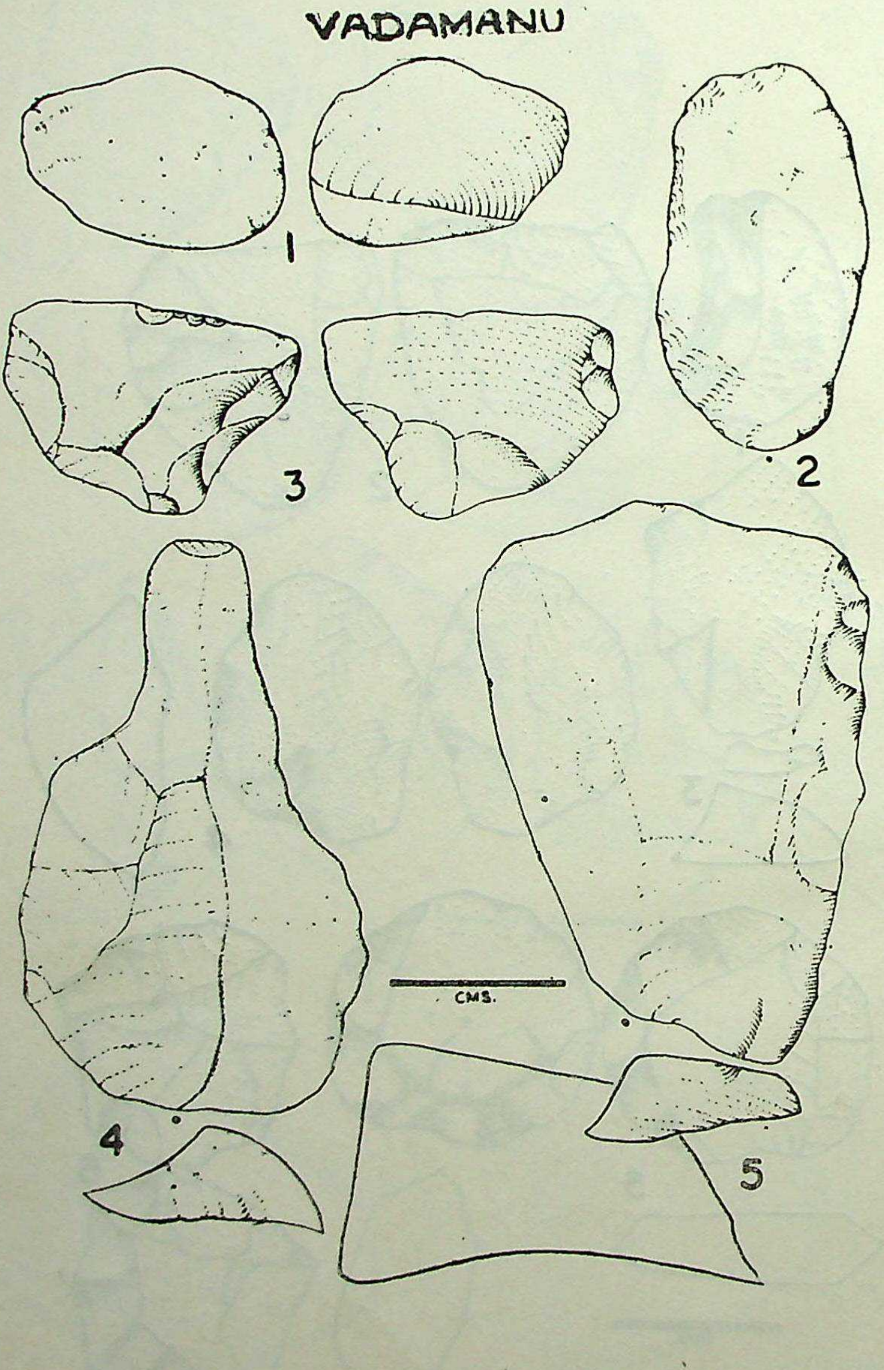
Pl.-XI

NITTUR

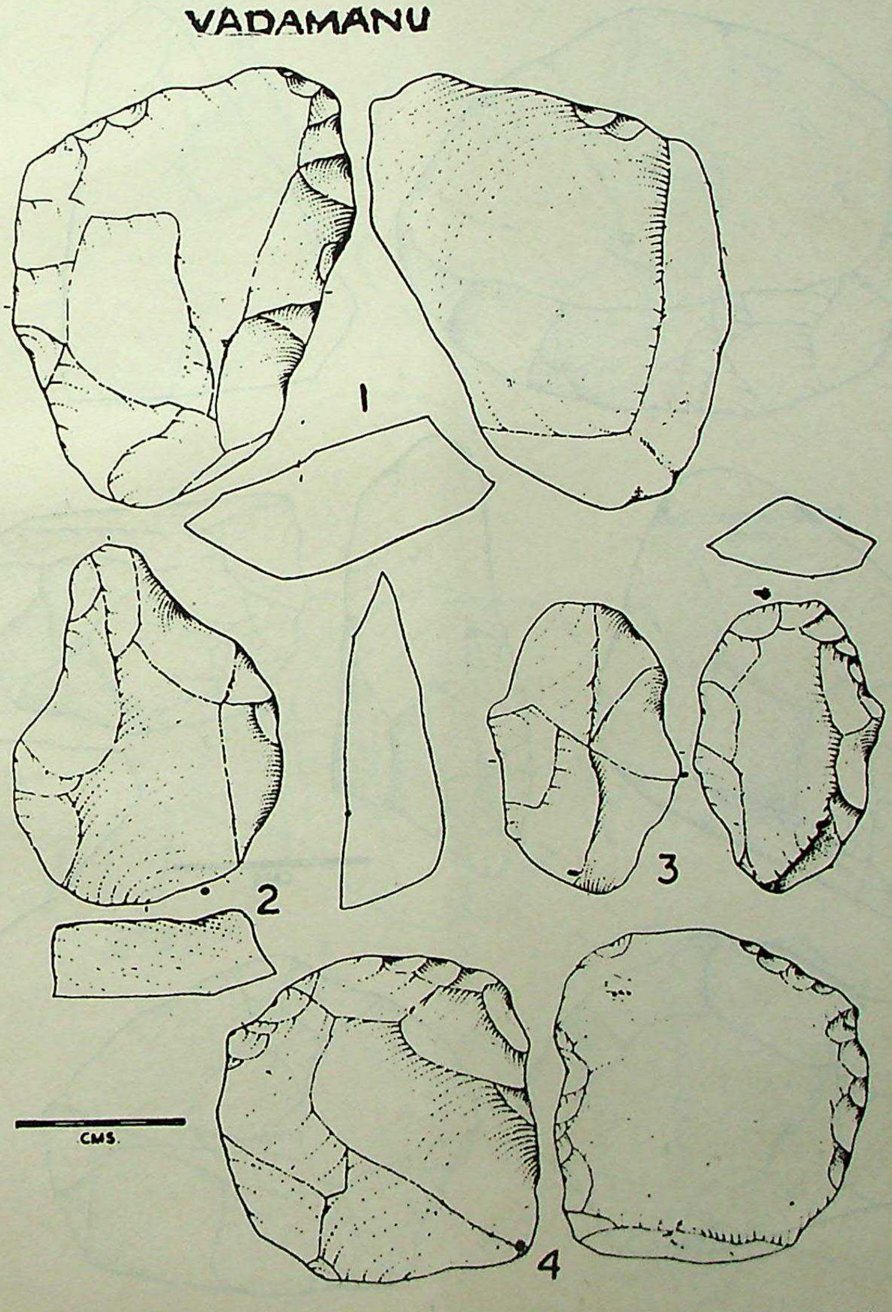


1. Side-scraper on flake type III; 2. Chopping-tool; 3. Partially reworked flake type IX; 4. Bifacially prepared core; 5, Tortoise core; 6. Lovallois core.

Pl.-XII

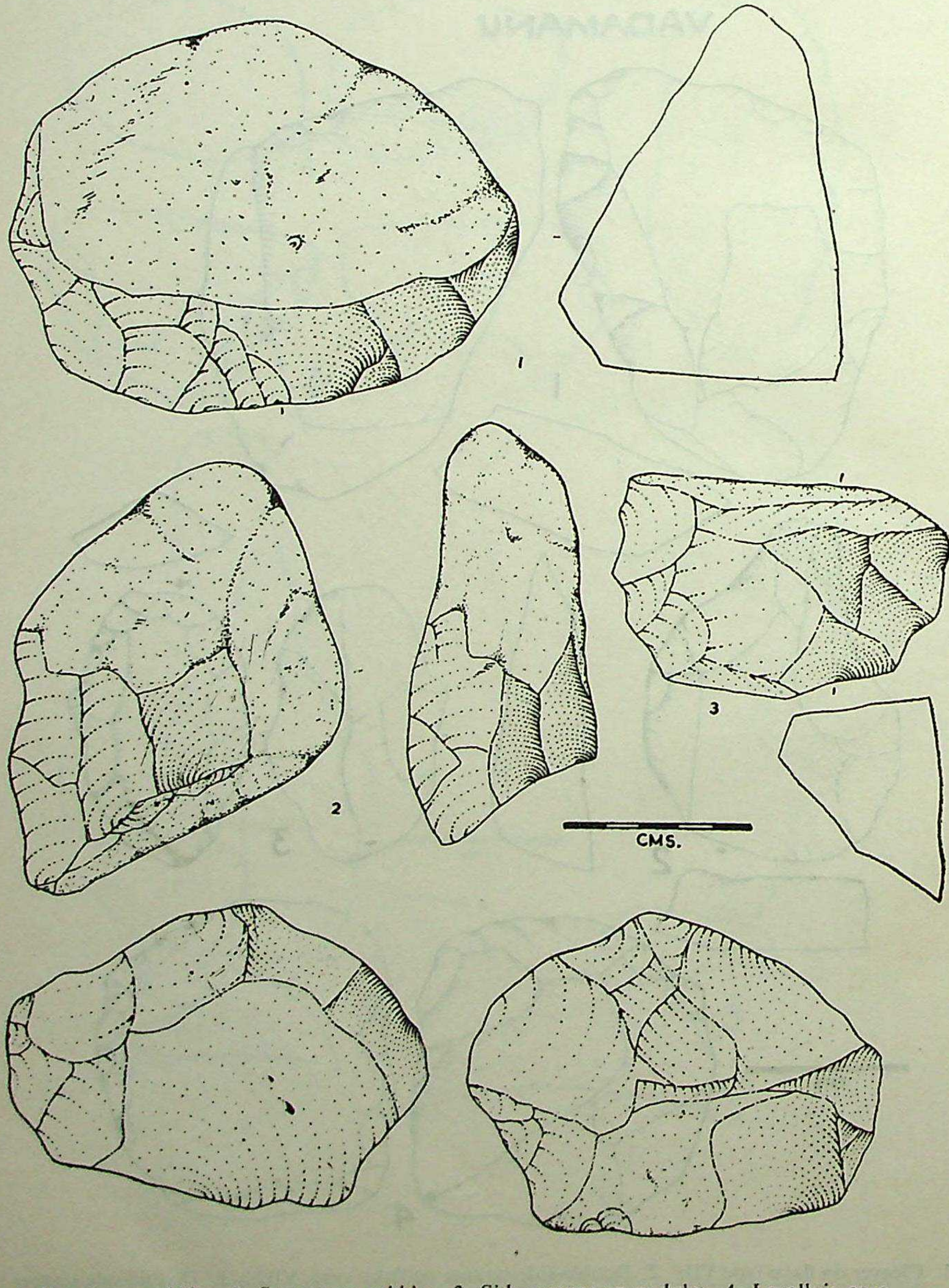

VADAMANU
1
2
3
4
5
CMS.

1, Unprepared flake; 2. Side-scraper on unprepared flake; 3. Side-scraper on unprepared flake; 4. Flake type IV; 5. Partially retouched flake type V.


VADAMANU
1
2
3
4
CMS.

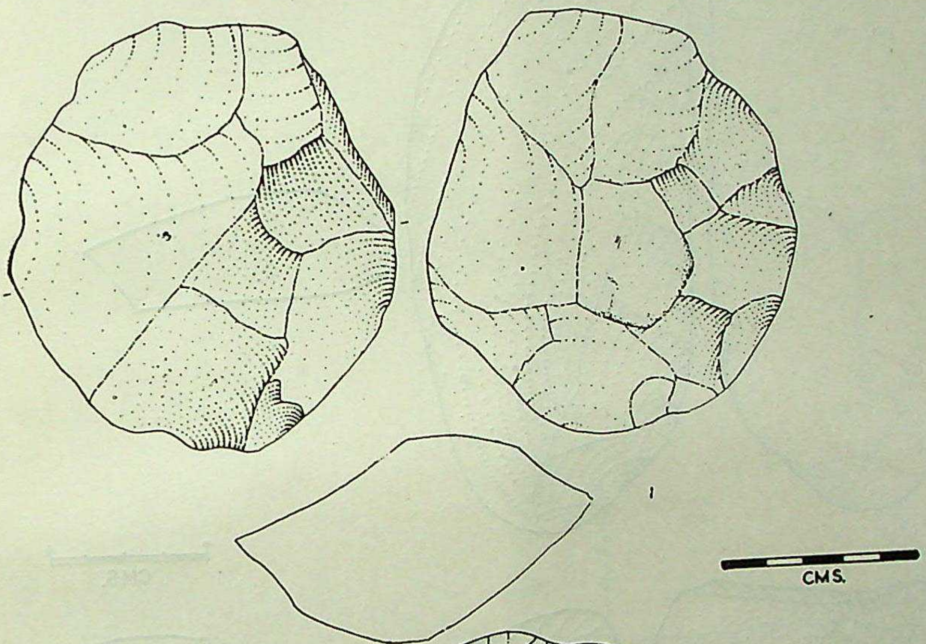
1. Cleaver on flake type VII; 2. Double-side-scraper on flake type VIII; 3. Double-side-scraper on Levallois flake; 4. Side-scraper on Levallois flake.

ANAGWADI

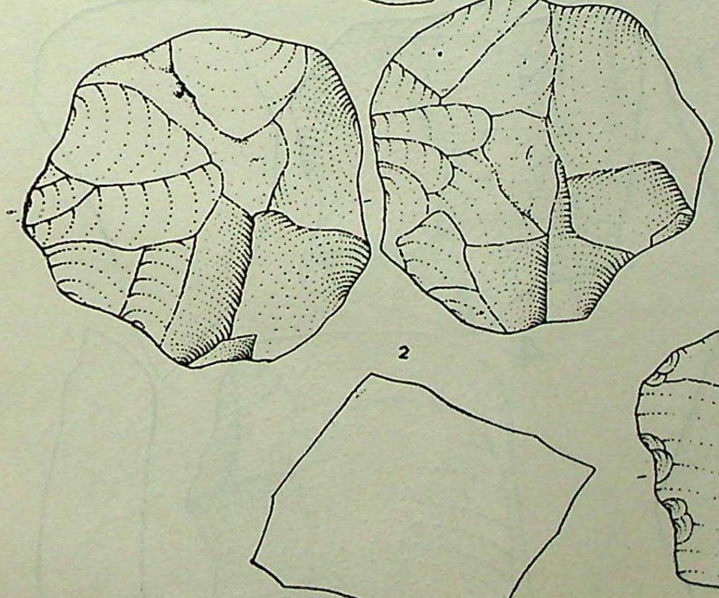


1. Scraper on pebble; 2. Scraper on pebble; 3. Side scraper on nodule; 4. Levallois core.

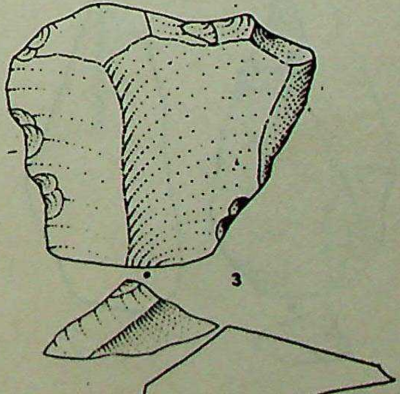
ANAGWADI



1



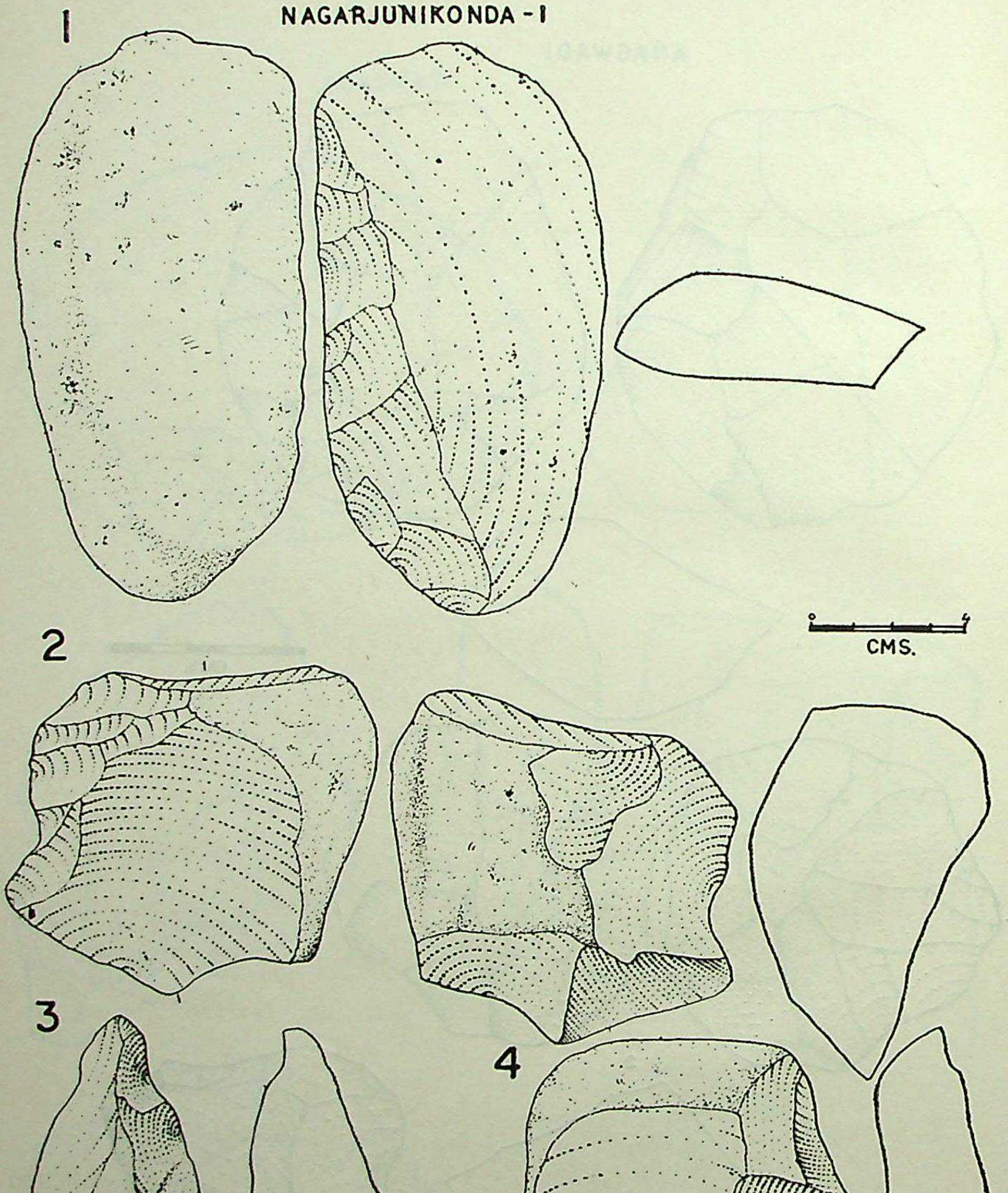
2



3

1. Bifacial Mousterian core; 2. Bifacial Mousterian core; 3. Partially retouched flake type IX.

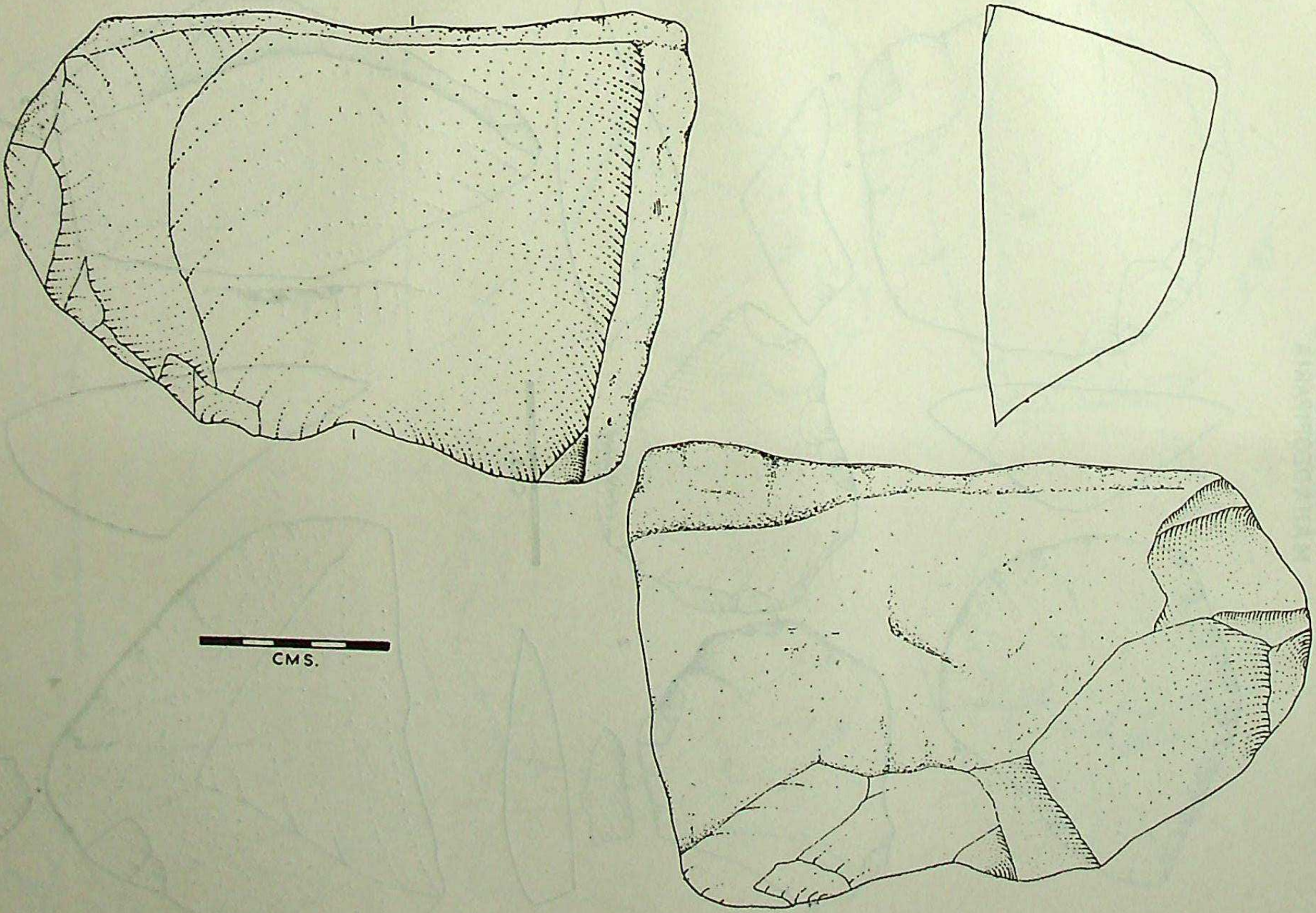
Pl.-XVI


NAGARJUNIKONDA - I
1
2
3
4
0
4
CMS.

1. Cleaver on unprepared flake; 2. Core type II; 3. Partially retouched flake type V; 4. Flake type V.

Pl.-XVII

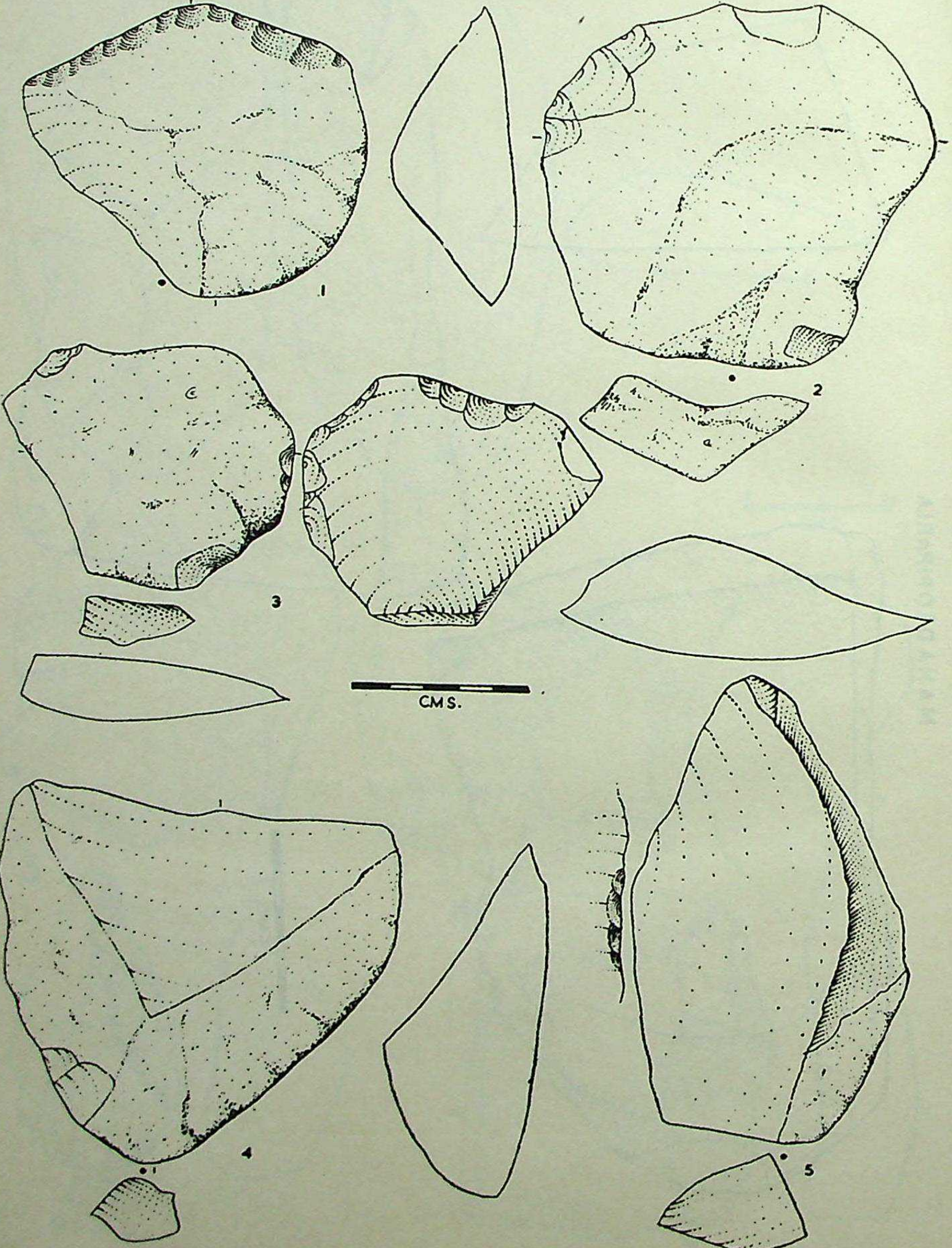
MAHADEOPIPARIA



Core made on a massive flake type II.

Pl.-XVIII

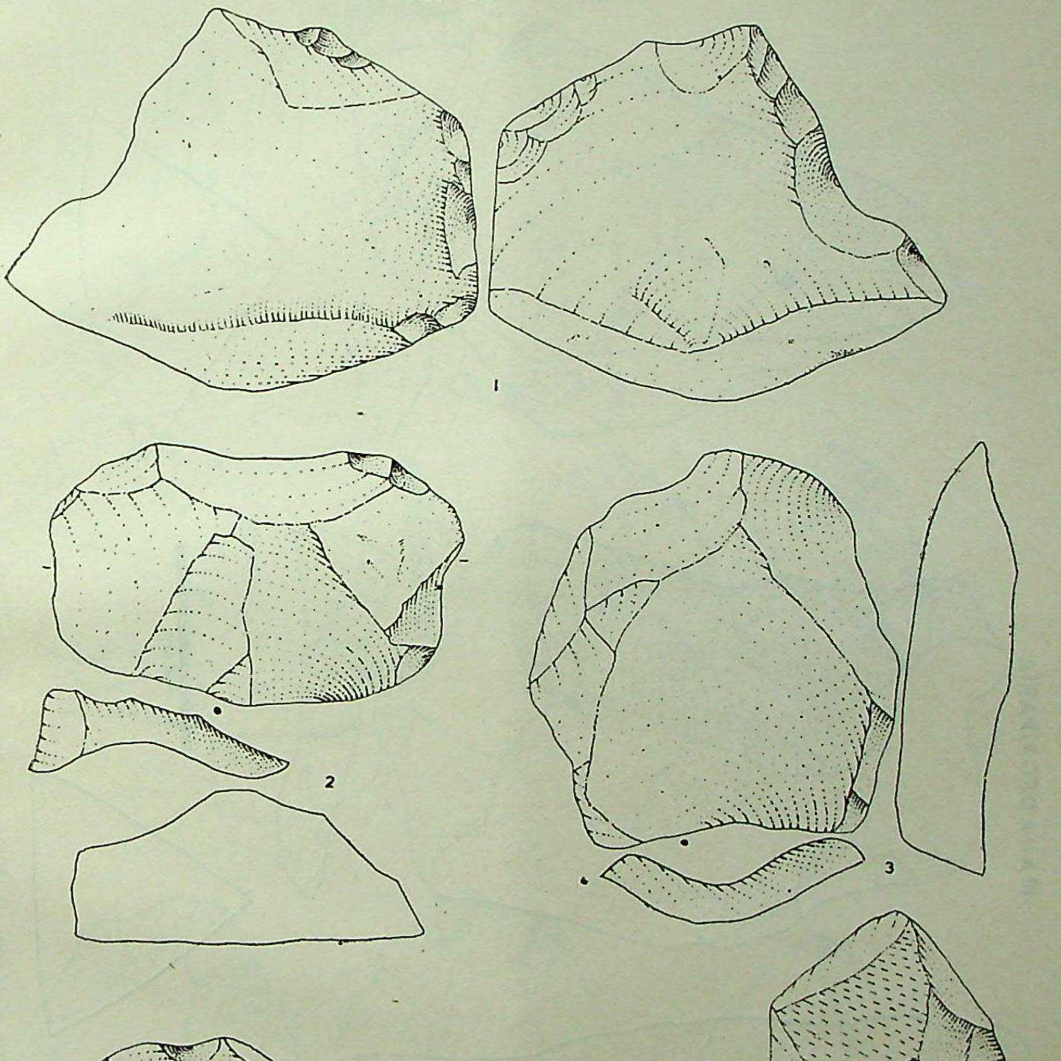
MAHADEOPIPARIA



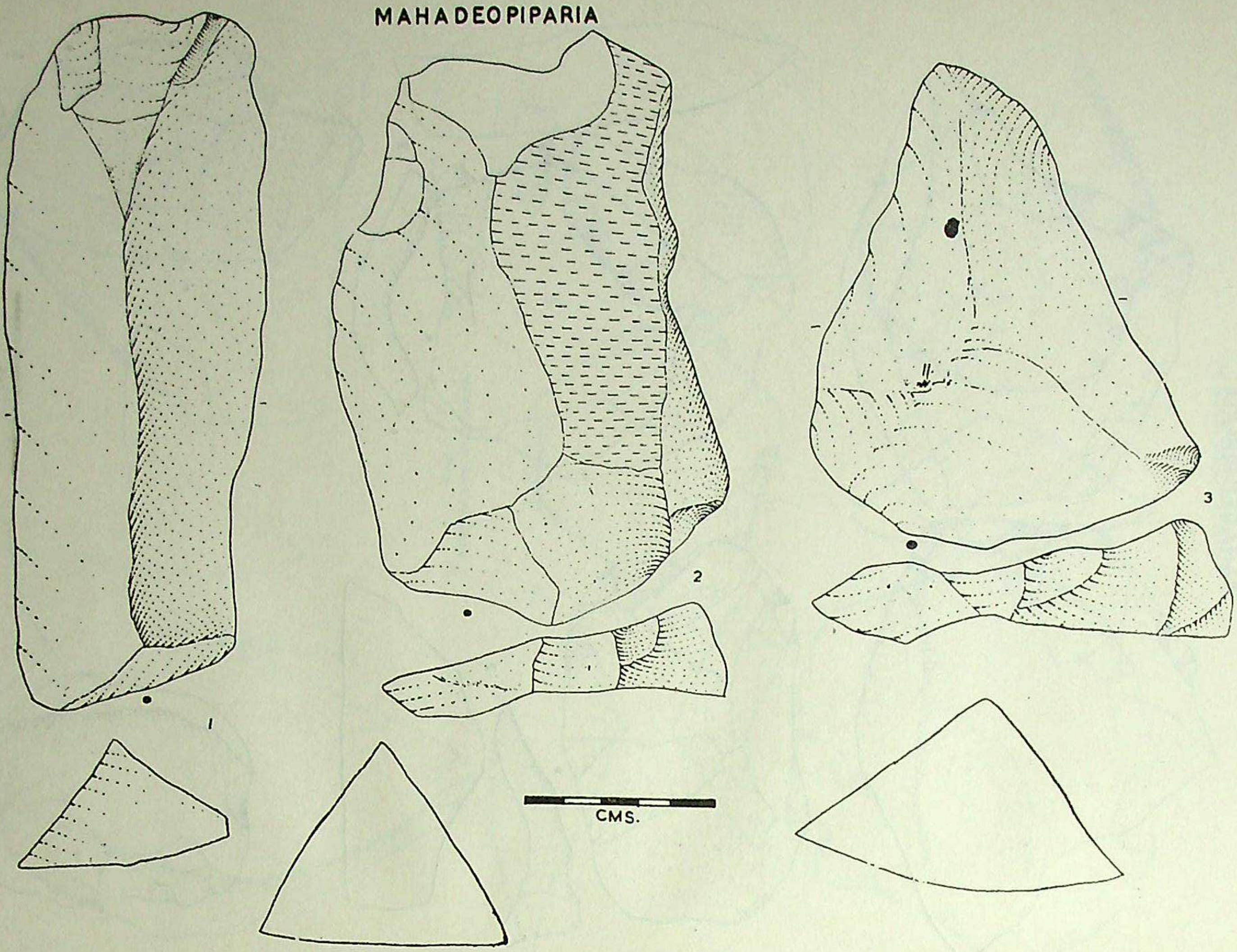
1. Wide-scraper on prepared flake; 2. Partially retouched unprepared flake; 3. Side-scraper on flake type II; 4. Partially retouched flake-type V; 5. Flake type VIII.

Pl.-XIX

MAHADEO PIPARIA

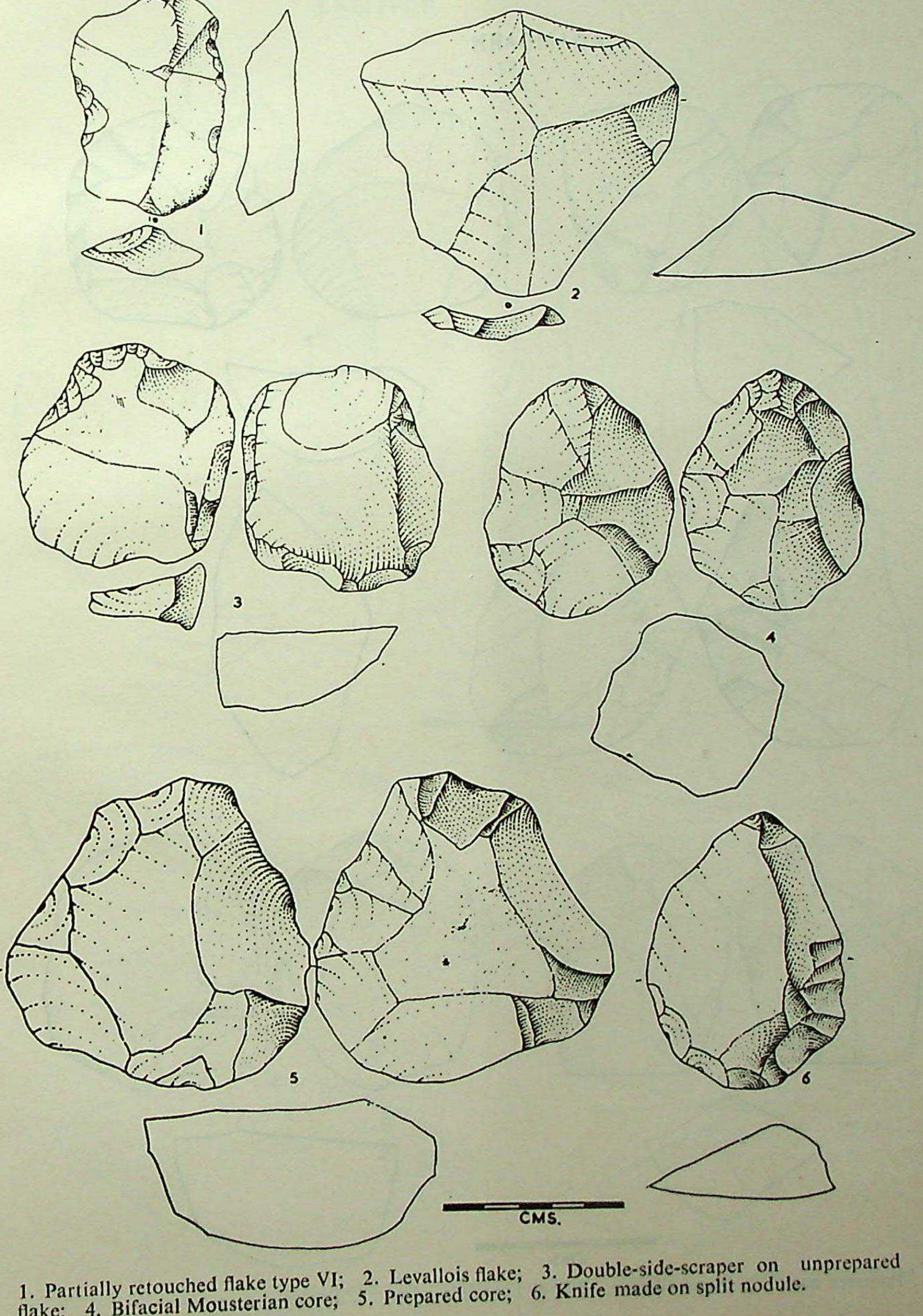


1. Double-side-scraper on flake type VII; 2. Partially retouched Levallois flake; 3. Levallois flake; 4. Prepared flake; 5. Flake type IX.


MAHADEOPIPARIA
1
2
3
CMS.

1. Blade with unfaceted striking platform; 2. Flake type VI; 3. Levallois flake.

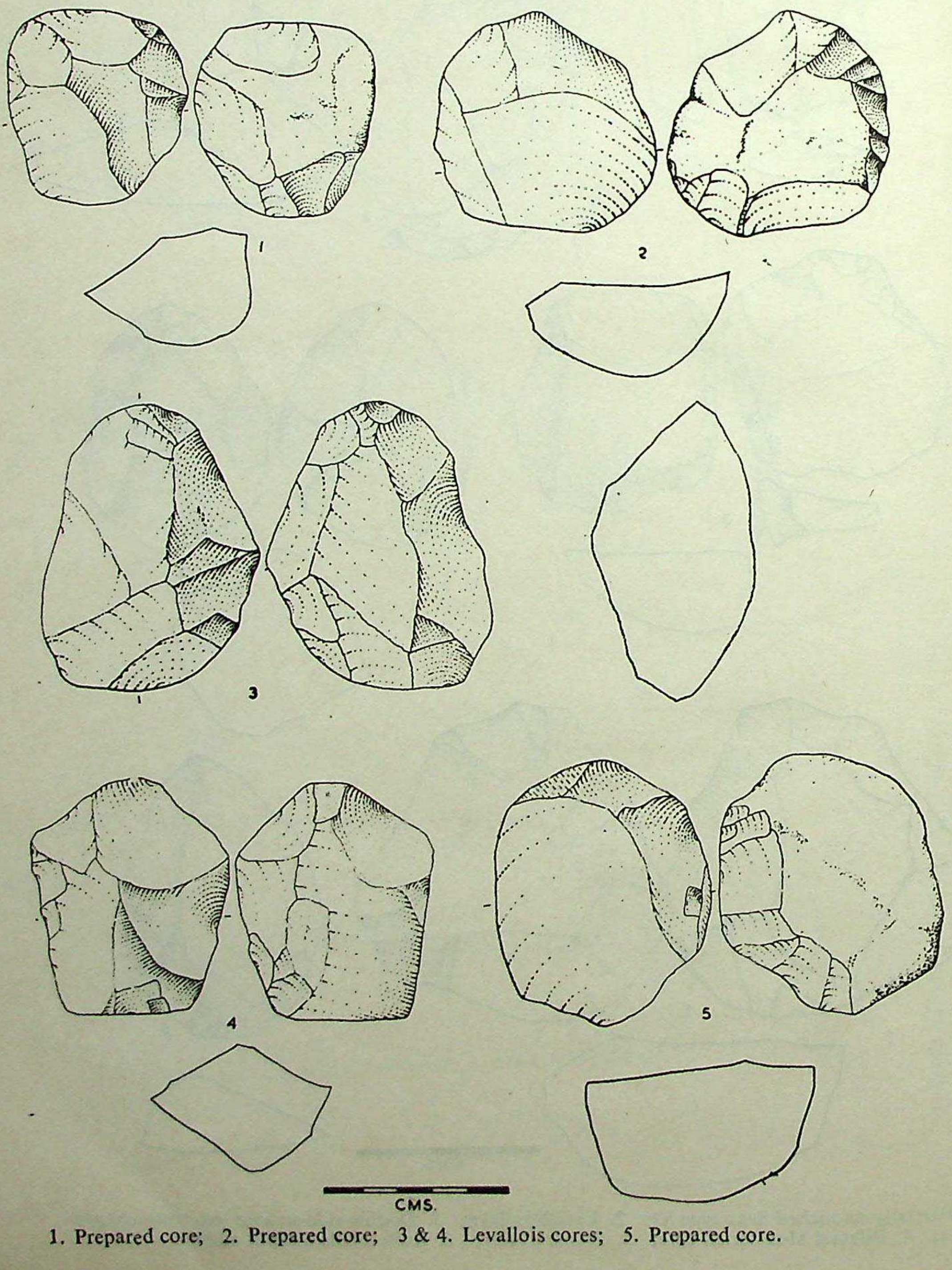
ADAMGARH



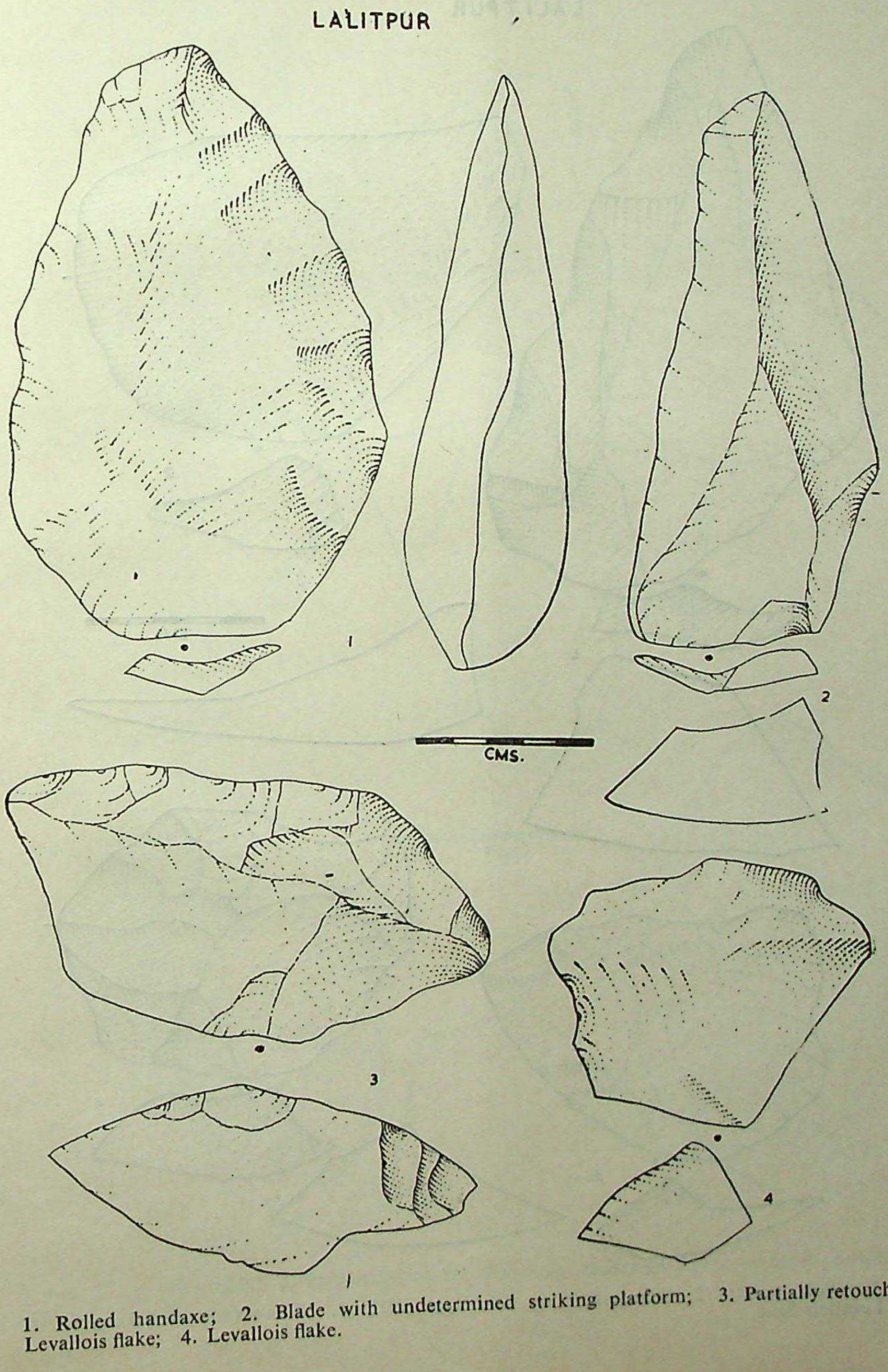
1. Partially retouched flake type VI; 2. Levallois flake; 3. Double-side-scraper on unprepared flake; 4. Bifacial Mousterian core; 5. Prepared core; 6. Knife made on split nodule.

Pl.-XXII

ADAMGARH



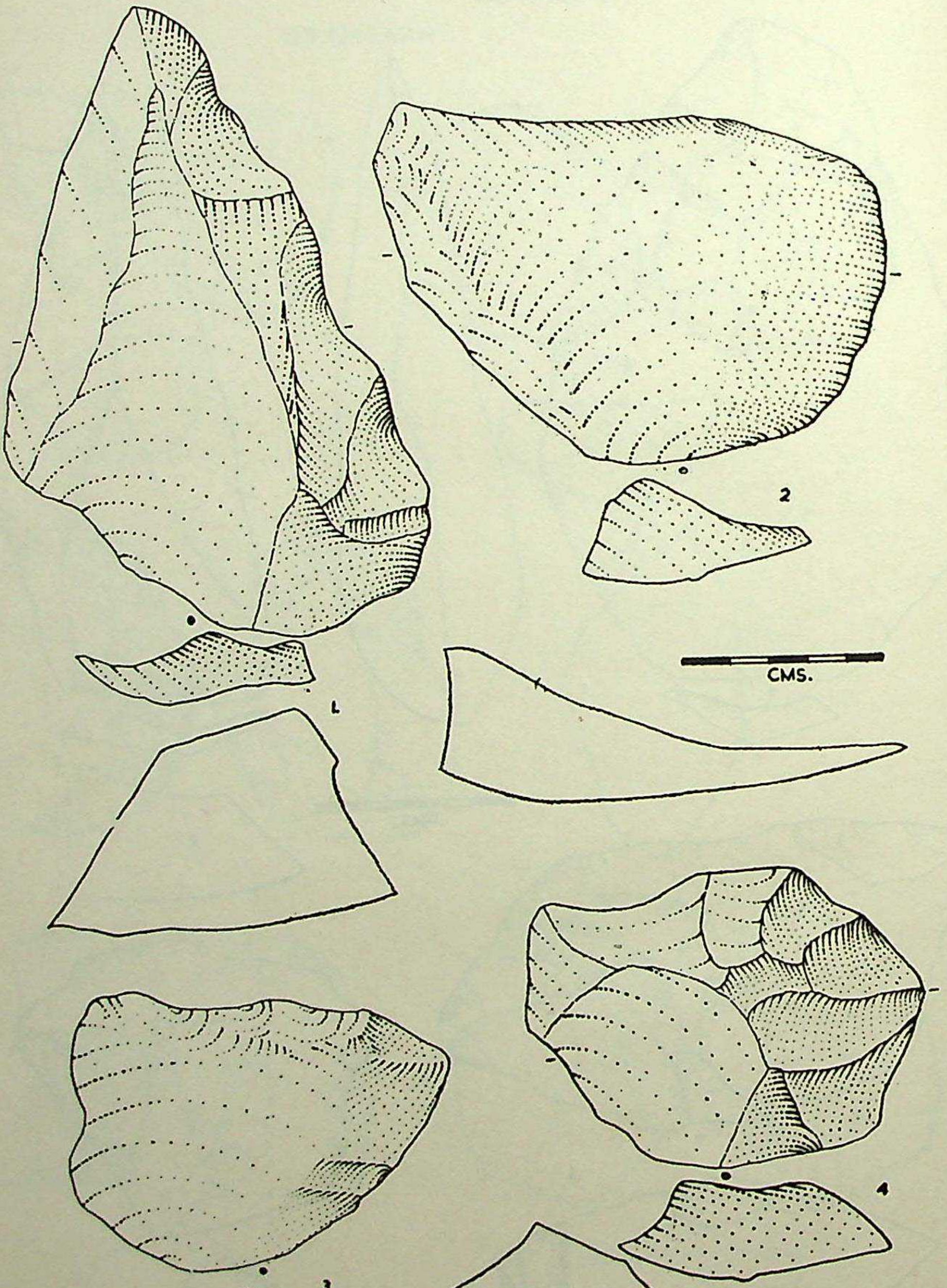
1. Prepared core; 2. Prepared core; 3 & 4. Levallois cores; 5. Prepared core.


LALITPUR
1
2
CMS.
3
4
1

1. Rolled handaxe; 2. Blade with undetermined striking platform; 3. Partially retouched Levallois flake; 4. Levallois flake.

Pl.-XXIV

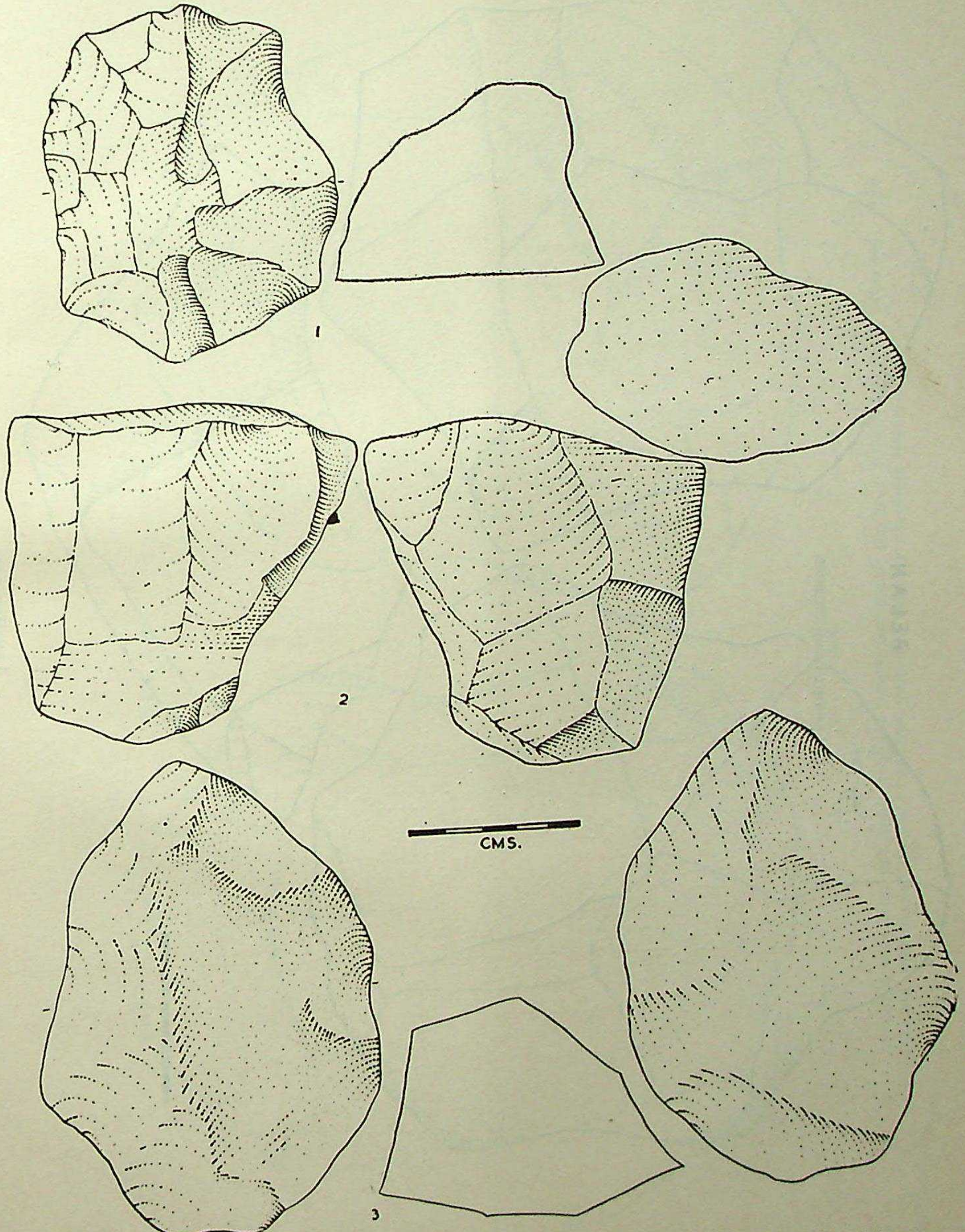
LALITPUR



1. Levallois point; 2. Side-scraper on flake type VIII; 3. Wide-scraper on flake type VIII; 4. Levallois flake.

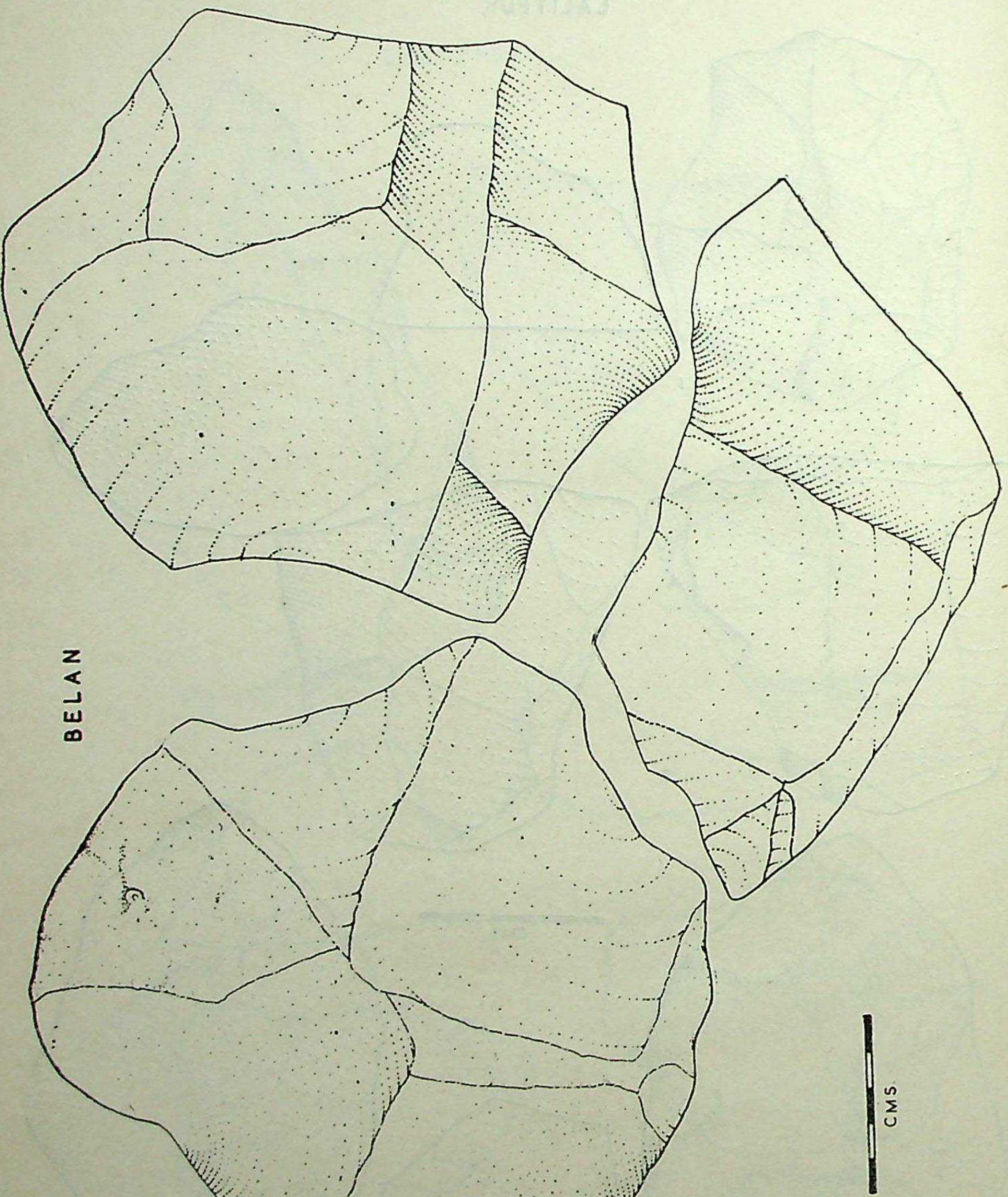
Pl.-XXV

LALITPUR



1. Scraper on split pebble; 2. Prepared core for detaching elongated flakes in blade detaching style; 3. Prepared core.

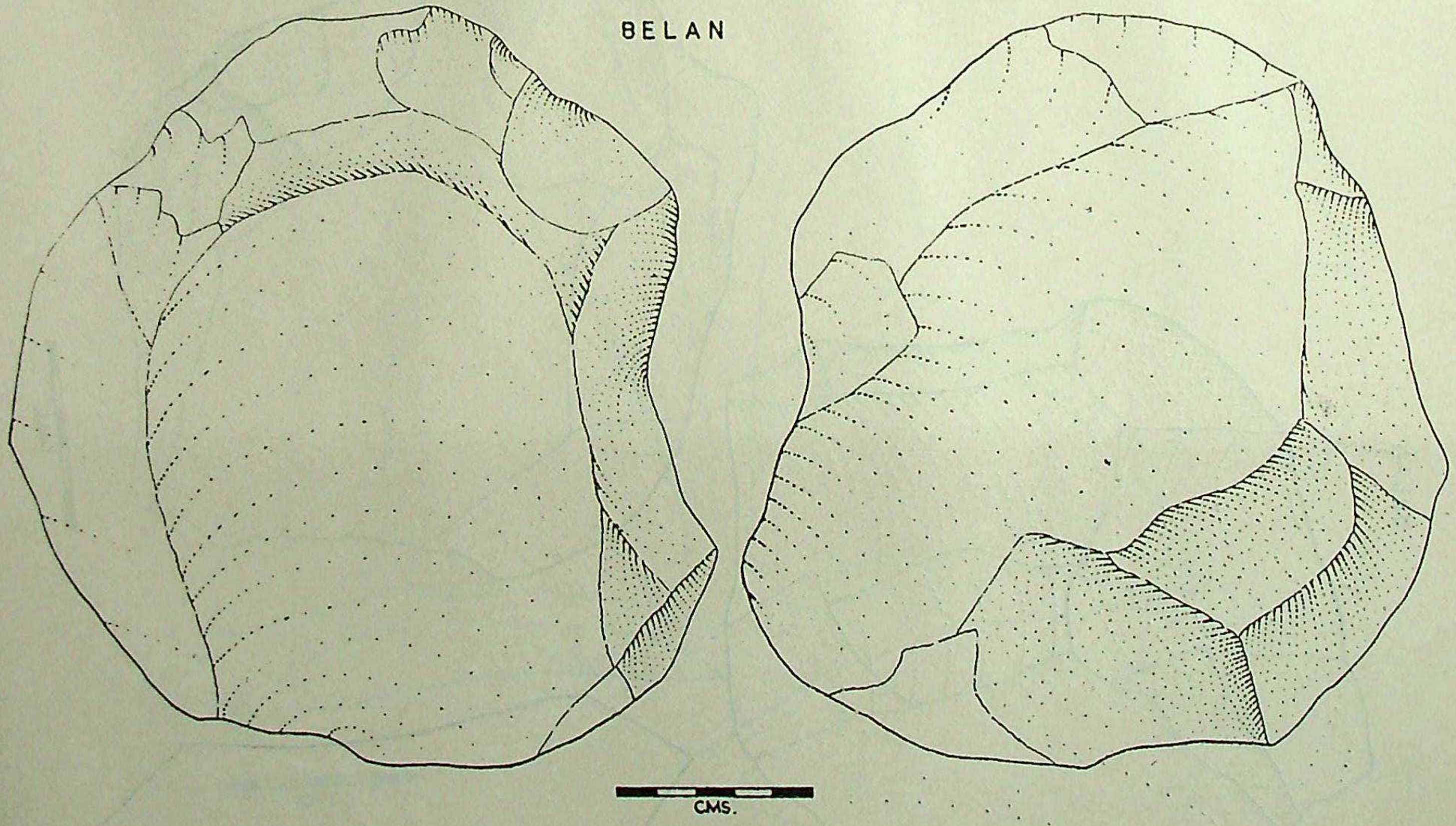
Pl.-XXVI



BELAN

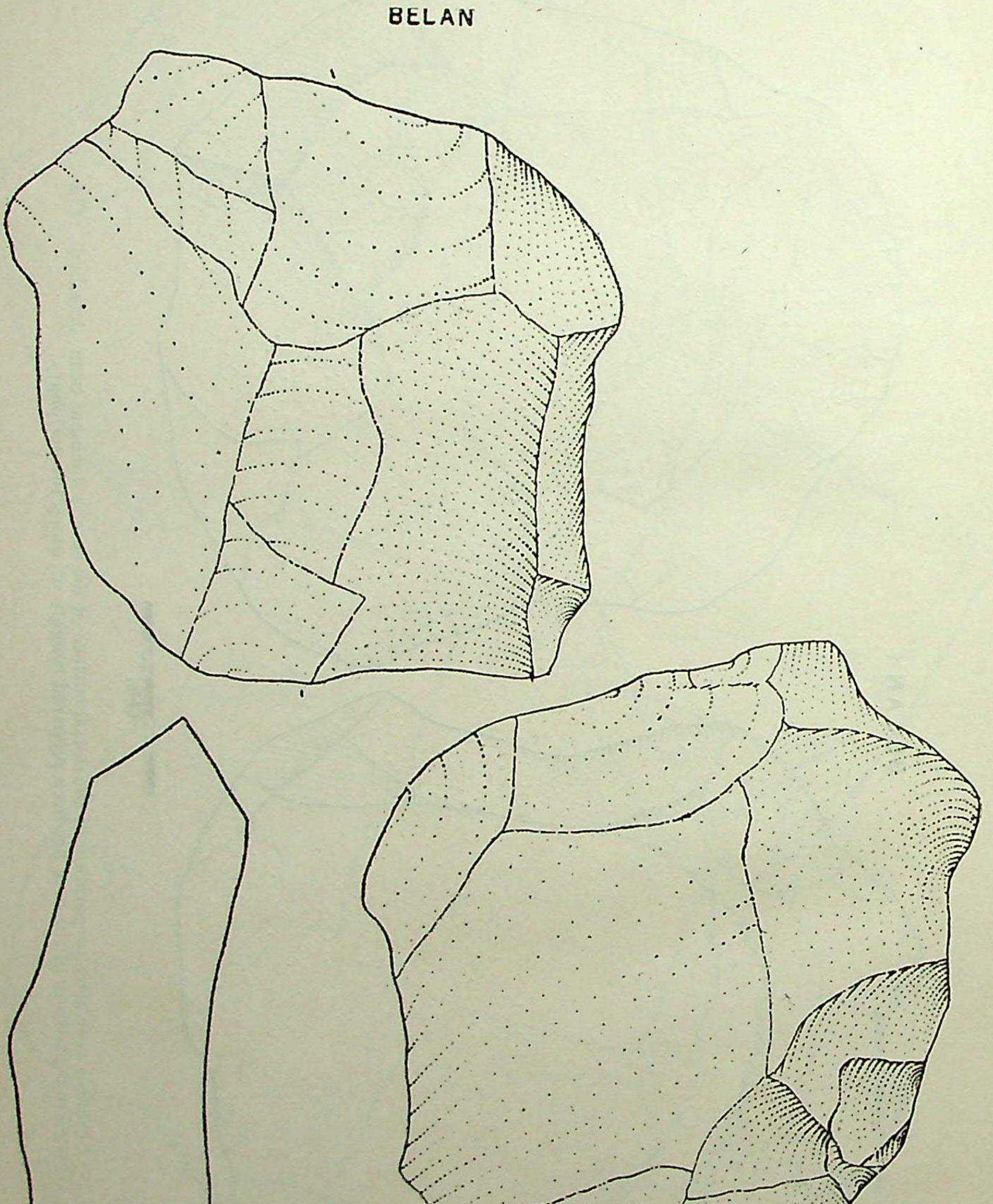
Levallois core

BELAN

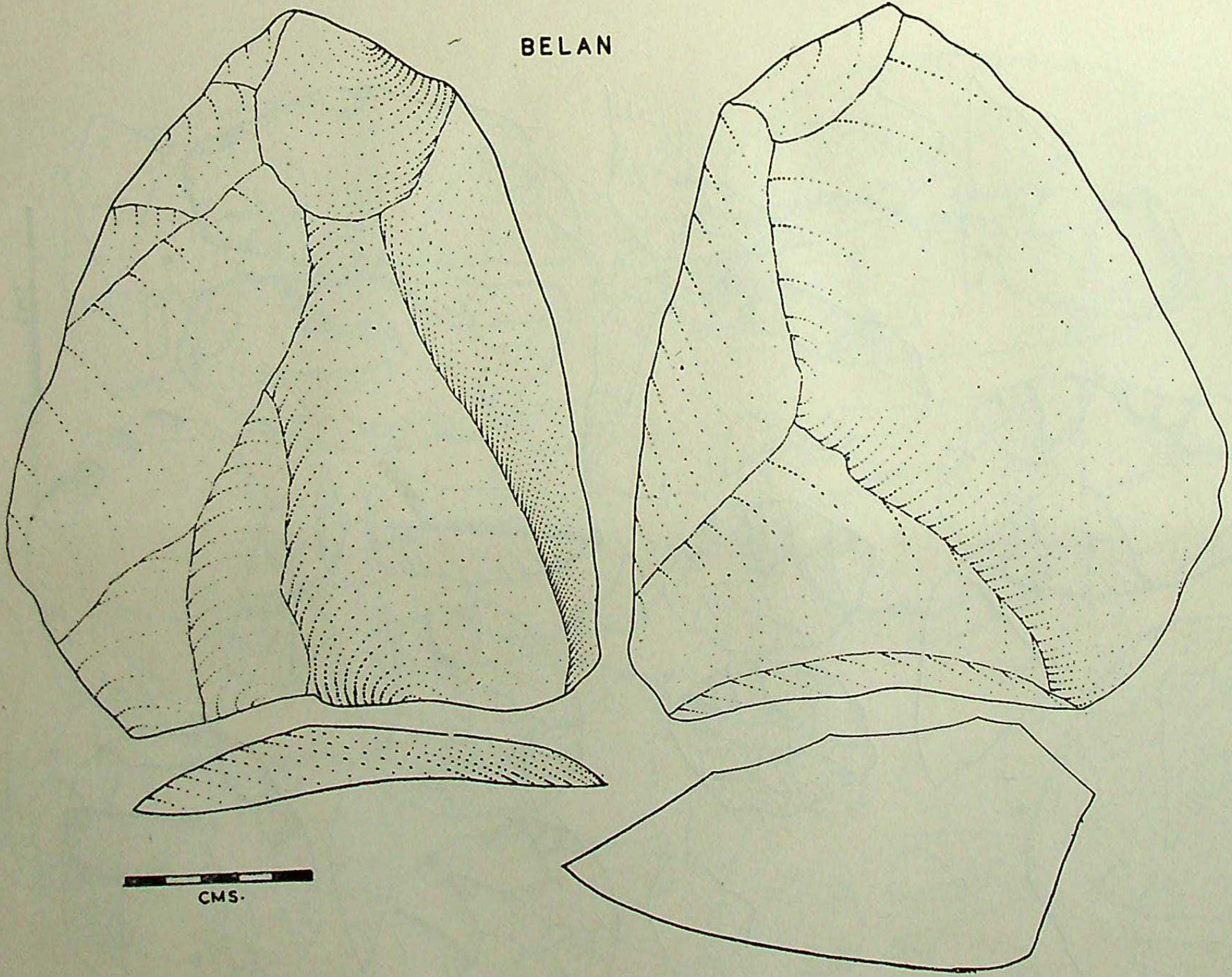


Levallois core after preparation of the dorsal surface of the core, a flake has been detached. The striking platform of the core has been prepared roughly all along the periphary.

Pl.-XXVIII



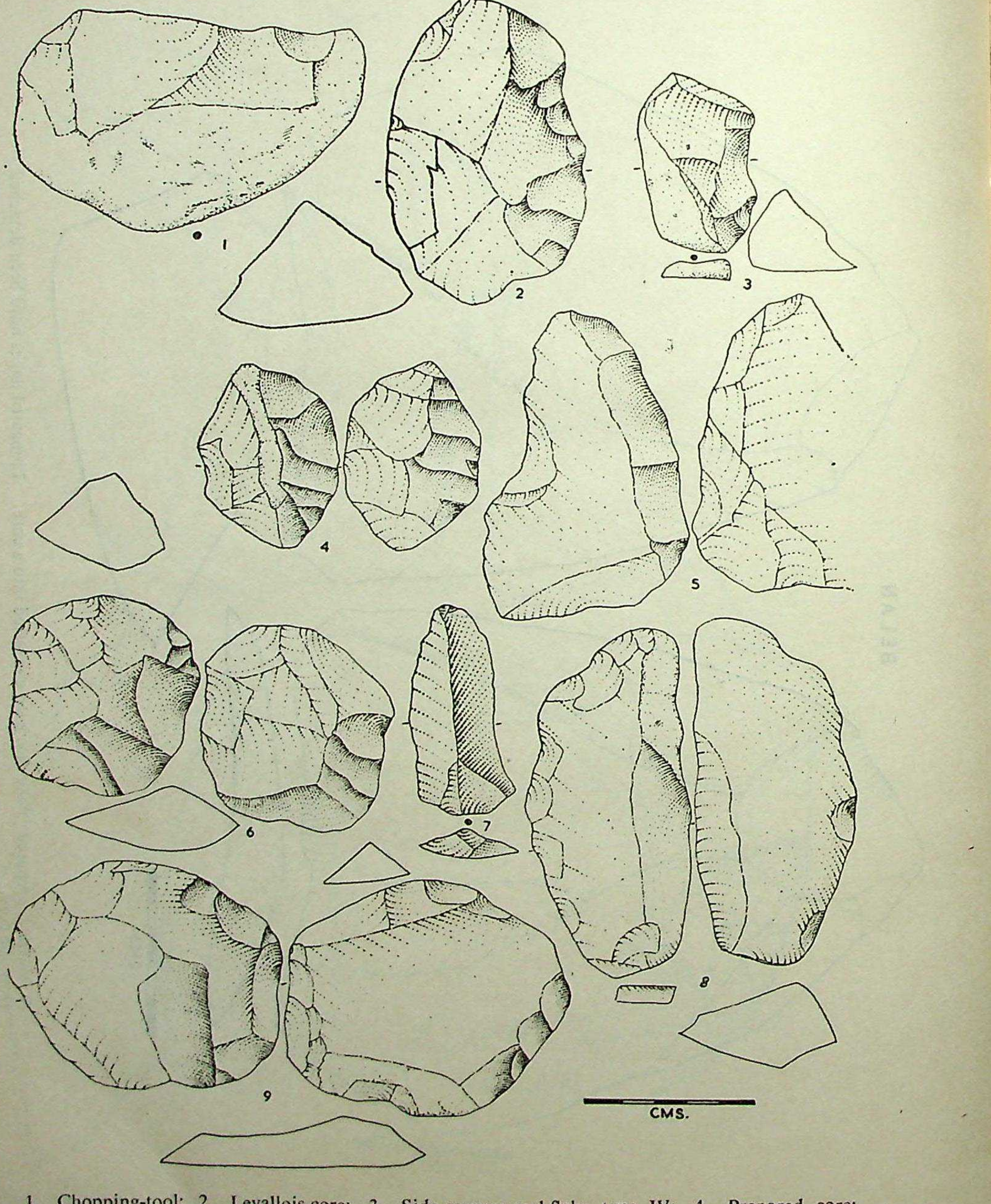
Core with prepared dorsal surface and prepared striking platform.



A Massive prepared flake has been converted into a core. Elongated flakes have been detached from the core.

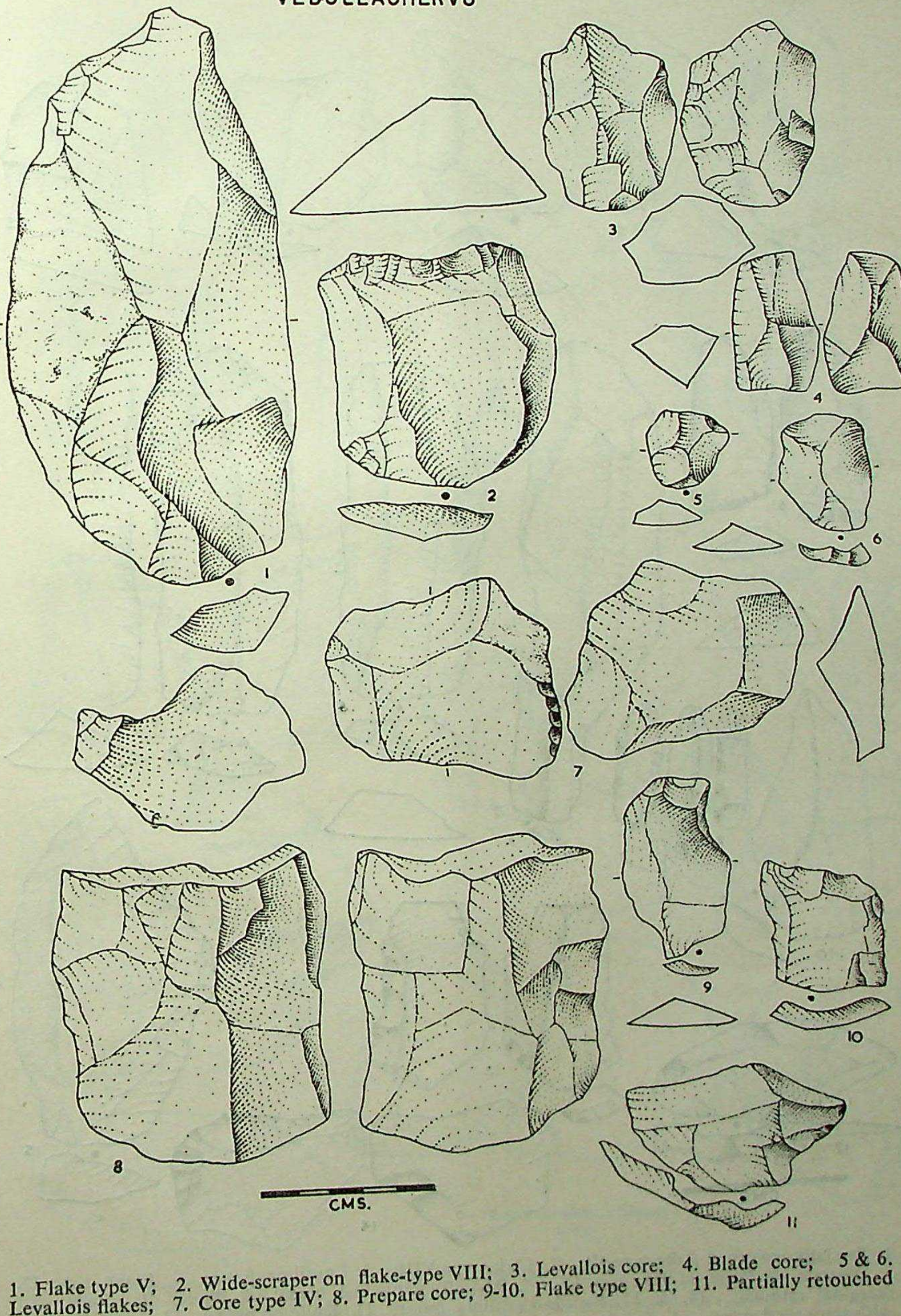
Pl.-XXX

VEDULLACHERVU

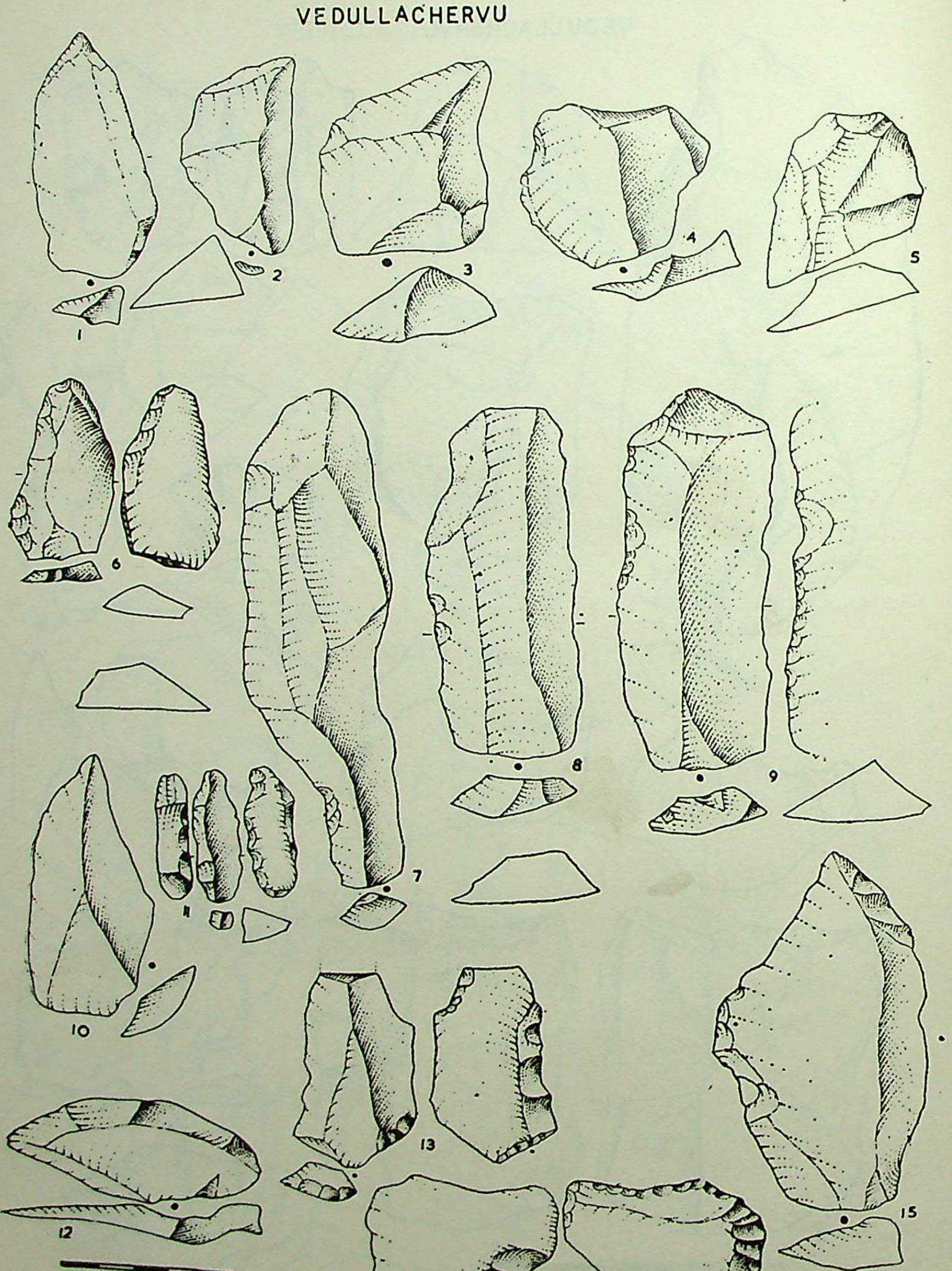


1. Chopping-tool; 2. Levallois core; 3. Side-scraper and flake type IV; 4. Prepared core; 5. Side-scraper on flake type VIII; 6. Mousterian Core; 7. Blade; 8. Side-scraper on, flake type VI; 9. Levallois core.

VEDULLACHERVU



1. Flake type V; 2. Wide-scraper on flake-type VIII; 3. Levallois core; 4. Blade core; 5 & 6. Levallois flakes; 7. Core type IV; 8. Prepare core; 9-10. Flake type VIII; 11. Partially retouched Levallois flake.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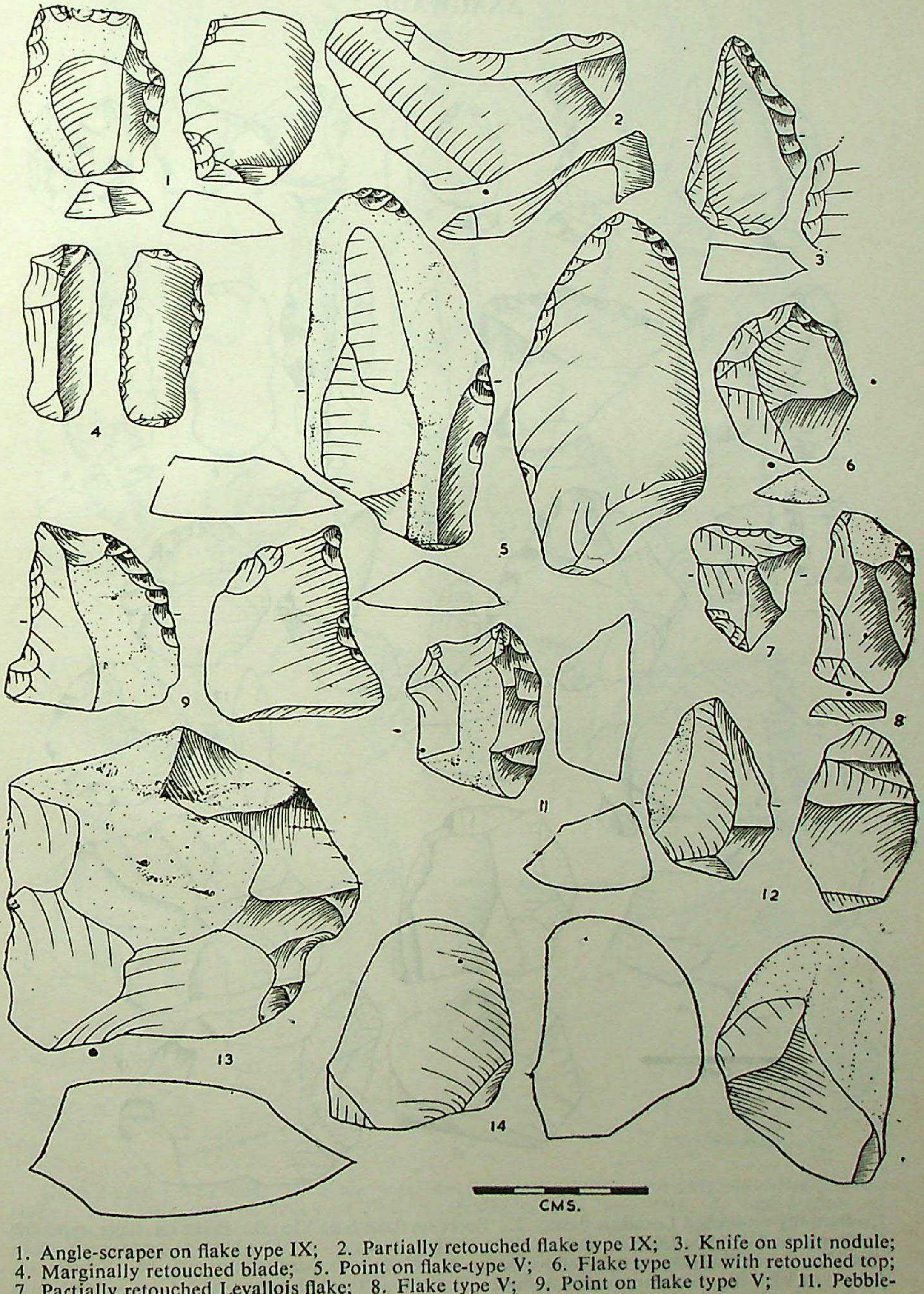
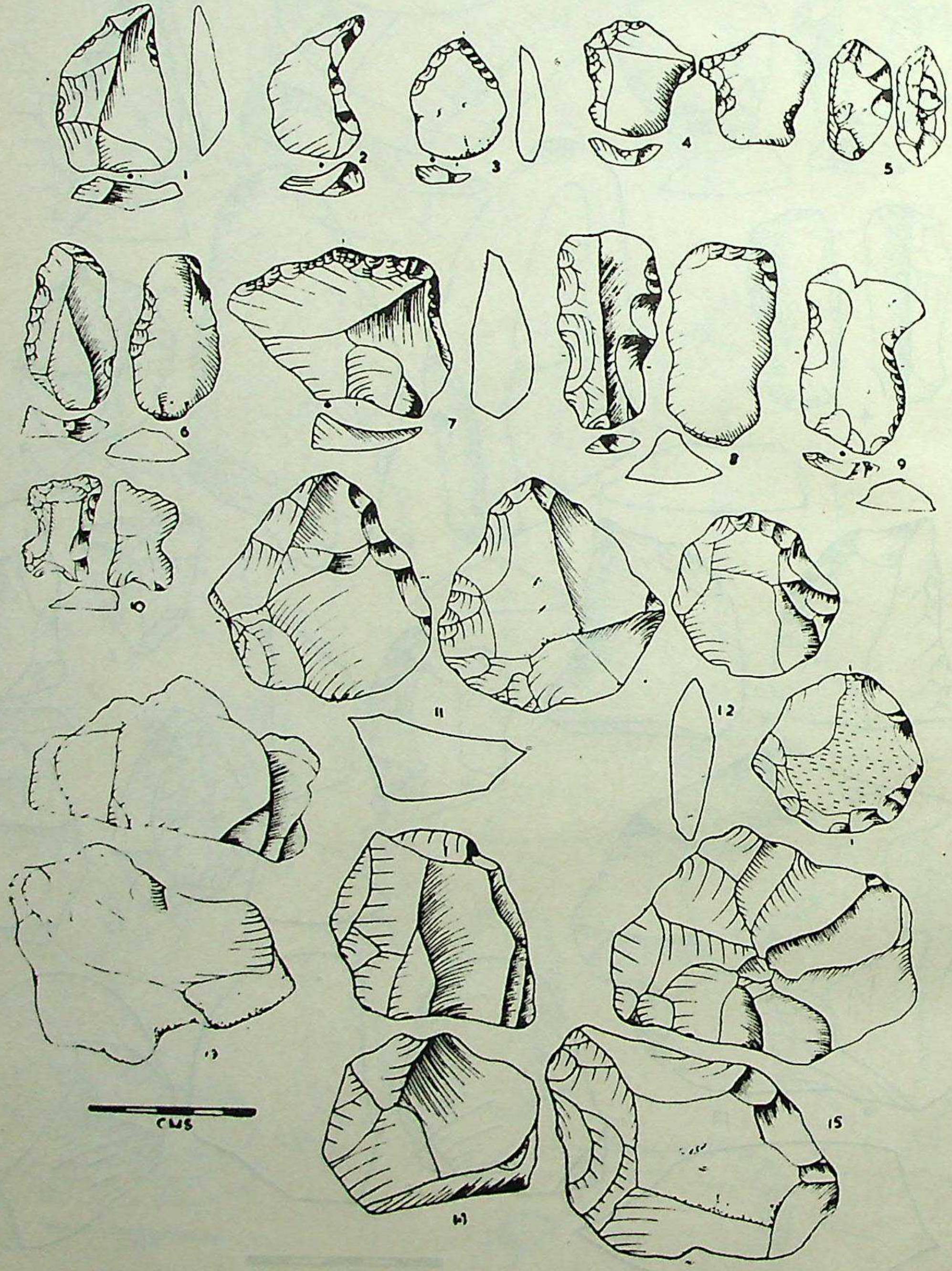
1. Partially reworked flake type VI; 2. Flake-type VIII; 3. Levallois flake; 4. Flake type IX; 5. Diverse; 6. Point on flake type IX, 7. Partially retouched blade; 8. Blade; 9. Blade with marginal retouch; 10. & 12. Pseudo-Levallois point; 11. Knife on blade; 13. Levallois point with retouched sides; 14. Side-scraper on flake type VIII; 15. Partially retouched flake type VIII.

VAMMANU



1. Angle-scraper on flake type IX; 2. Partially retouched flake type IX; 3. Knife on split nodule; 4. Marginally retouched blade; 5. Point on flake-type V; 6. Flake type VII with retouched top; 7. Partially retouched Levallois flake; 8. Flake type V; 9. Point on flake type V; 11. Pebble-scraper; 12, 13, 14. Partially prepared cores;

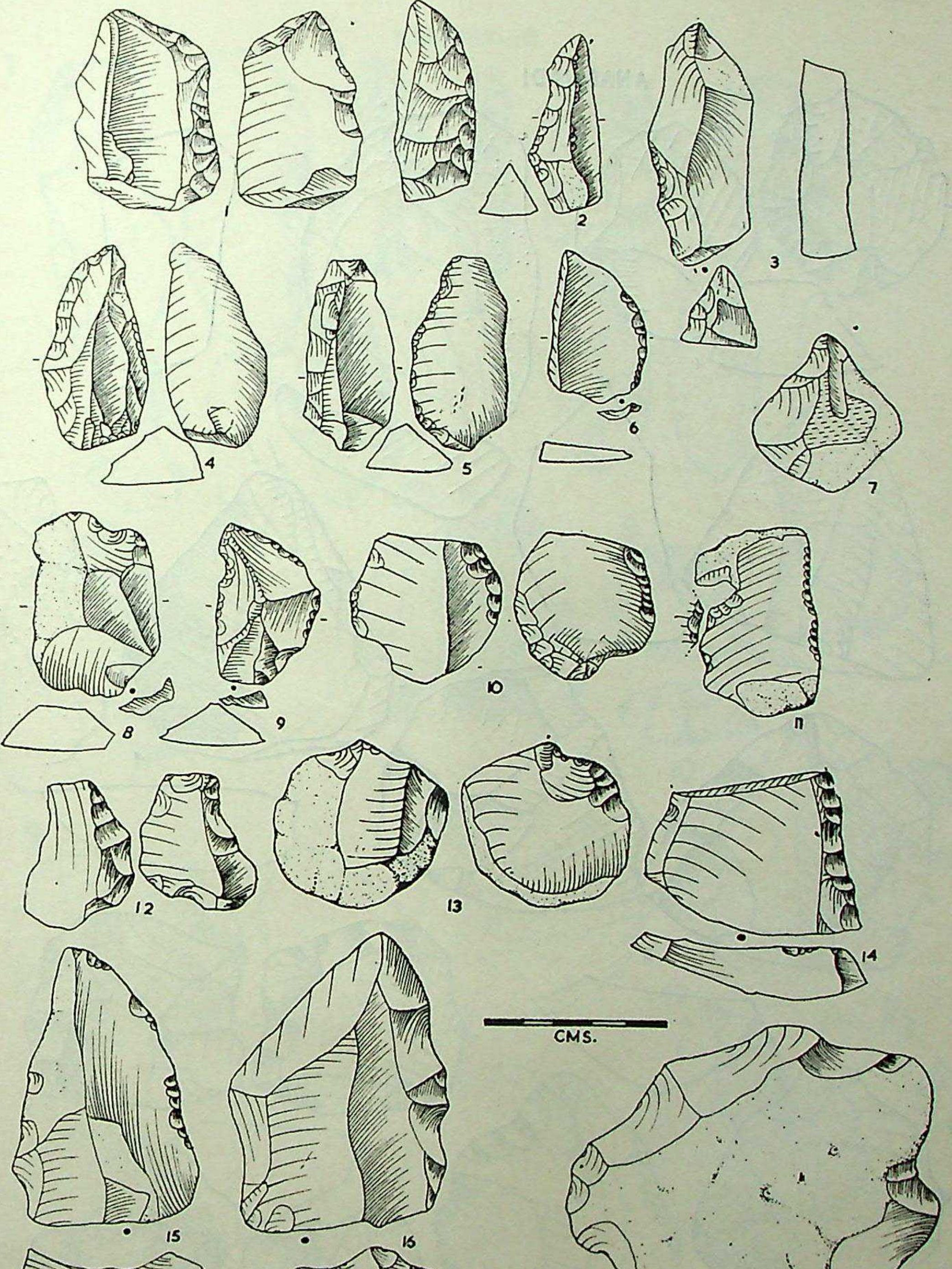
ANAGWADI



1. Partially retouched Levallois flake; 2. Borer on flake type VI; 3. Point on flake type II; 4. Borer on flake type IX; 5. Side-scraper on split nodule; 6. Double-side-scraper on flake type IX; 7. Wide-scraper on Levallois flake; 8. Blade with marginal retouch; 9. Scraper on flake type VI; 10. Scraper on split nodule; 11 to 13. Prepared cores; 14. Core for detaching blade; 15. Unifacial Mousterian core.

Pl.-XXXV

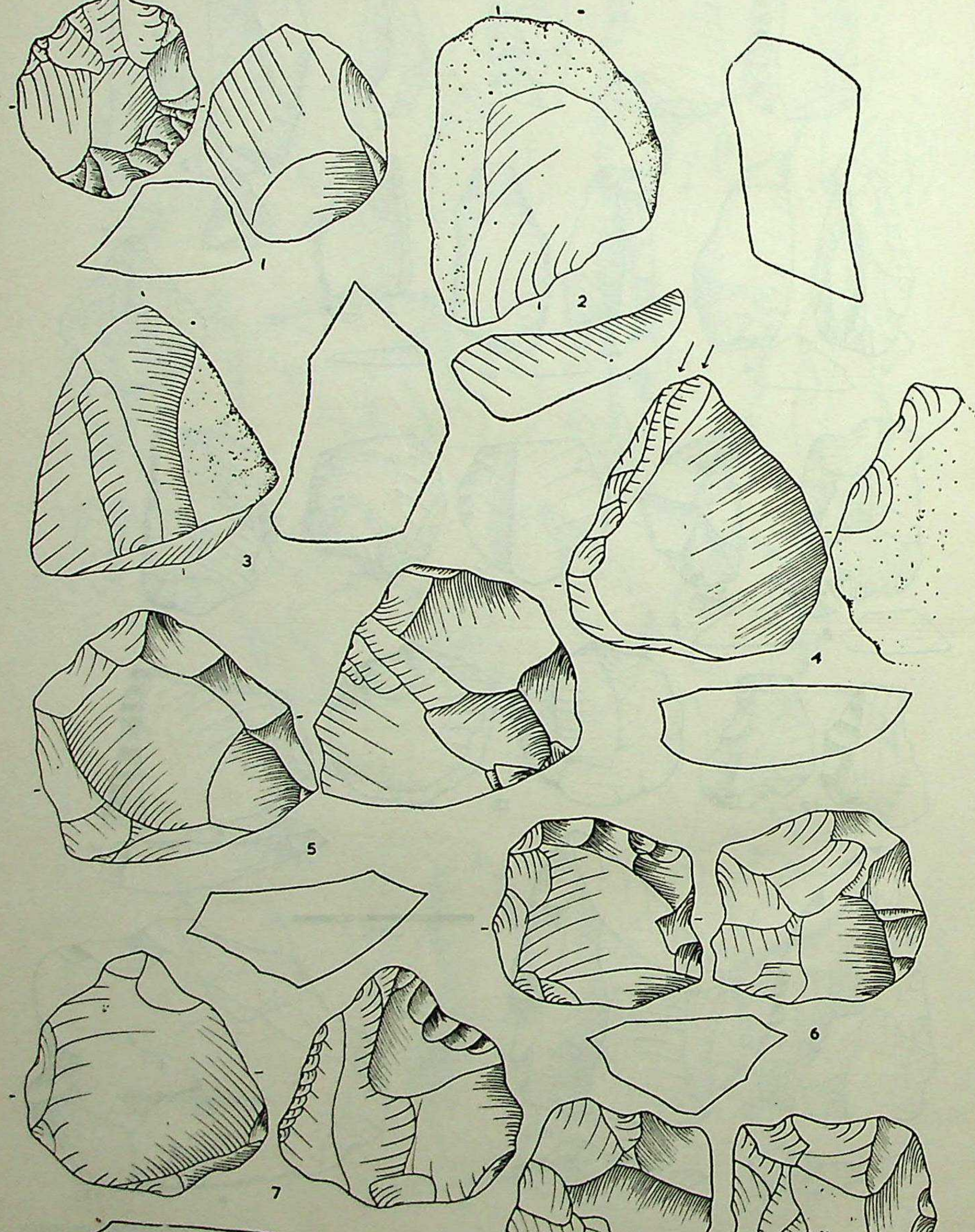
ANAGWADI



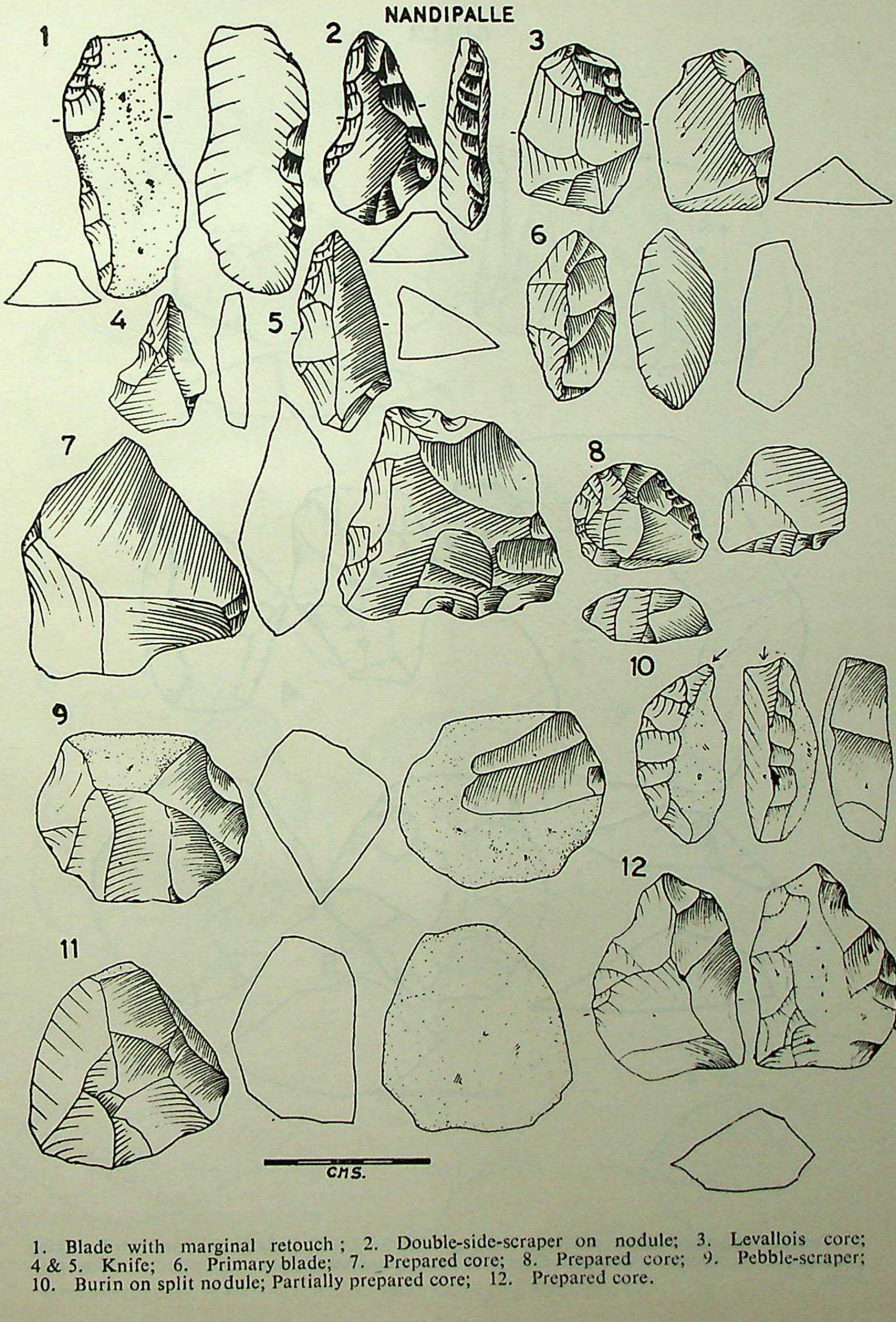
1. Knife on flake type VIII; 2. Blade with marginal retouch; 3. Partially retouched primary blade; 4. Side-scraper on flake type VIII; 5. Knife on flake type VIII; 6. Side-scraper on flake type IX; 6. Side-scraper on flake type IX; 7. Side-scraper on pebble; 8. Partially retouched flake type V; 9. Point on Levallois flake; 10. Blade with both the sides retouched; 11. Scrapper on split pebble; 12. Knife on split nodule; 13. Blade core on unprepared flake; 14. Side-scraper on undetermined flake; 15. Partially retouched flake type VI; 16. Side-scraper on flake type VIII; 17. Side-scraper on unprepared flake.

Pl.-XXXVI

ANAGWADI



1, Pebble-scraper; 2. Prepared core; 3. Pyramidal blade core; 4. Burin on a split pebble; 5, 6 & 8. Levallois core; 7. Flake type VIII.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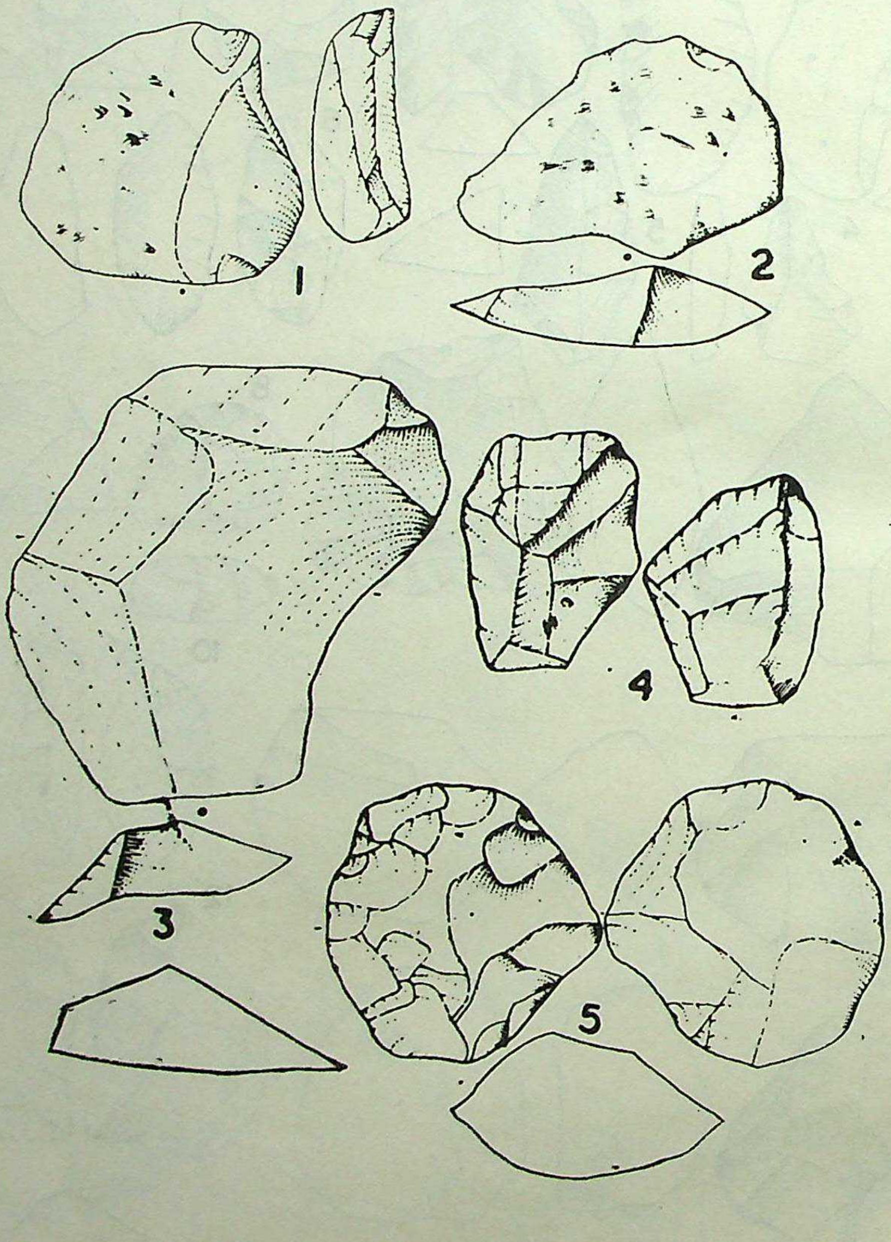
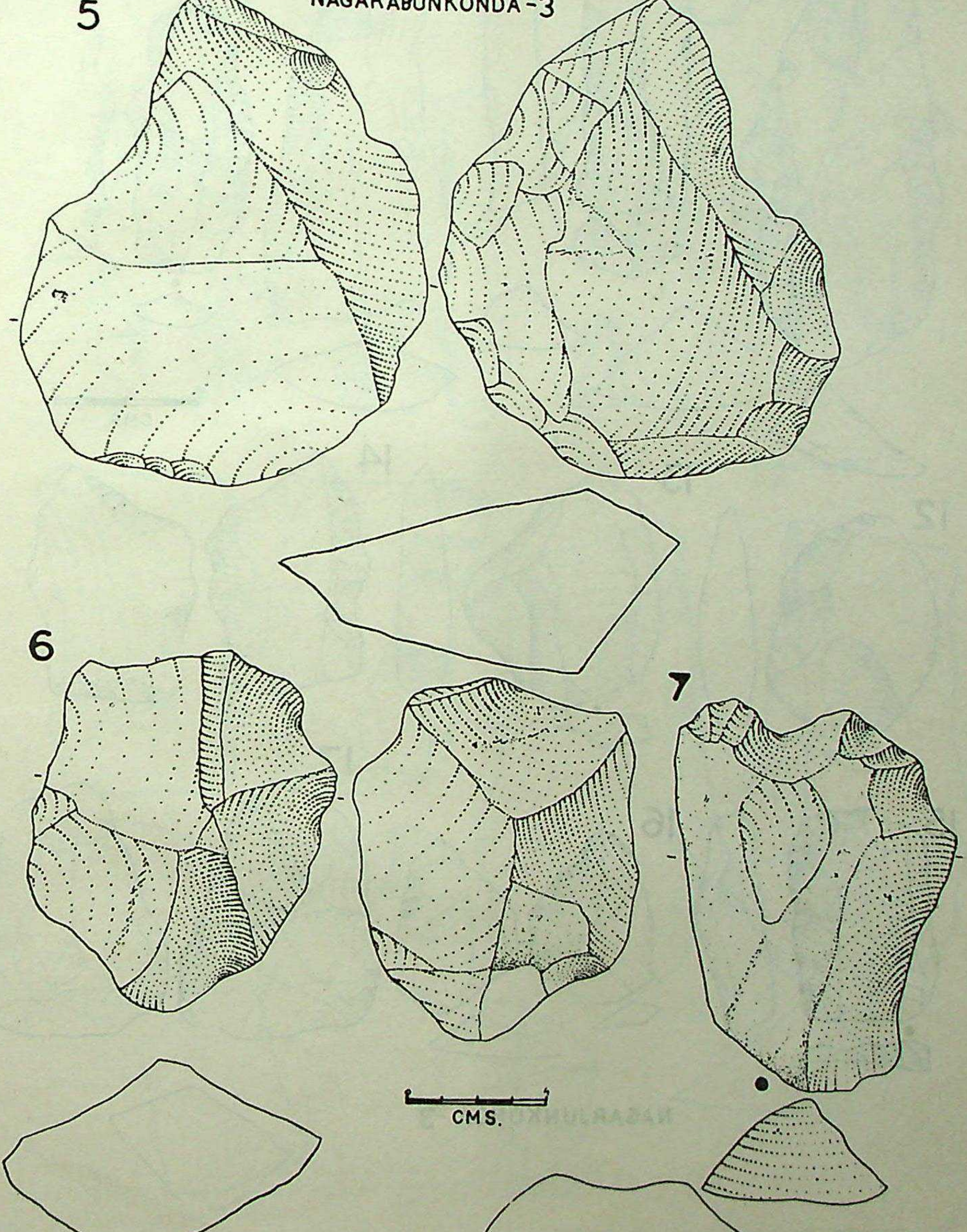
1. Blade with marginal retouch; 2. Double-side-scraper on nodule; 3. Levallois core; 4 & 5. Knife; 6. Primary blade; 7. Prepared core; 8. Prepared core; 9. Pebble-scraper; 10. Burin on split nodule; Partially prepared core; 12. Prepared core.

GULER



1. Partially retouched flake type III; 2. Flake type III; 3. Levallois flake with unfaceted striking platform; 4. Scraper on nodule; 5. Core with partly prepared dorsal and prepared striking platform.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NAGARABUNKONDA-3
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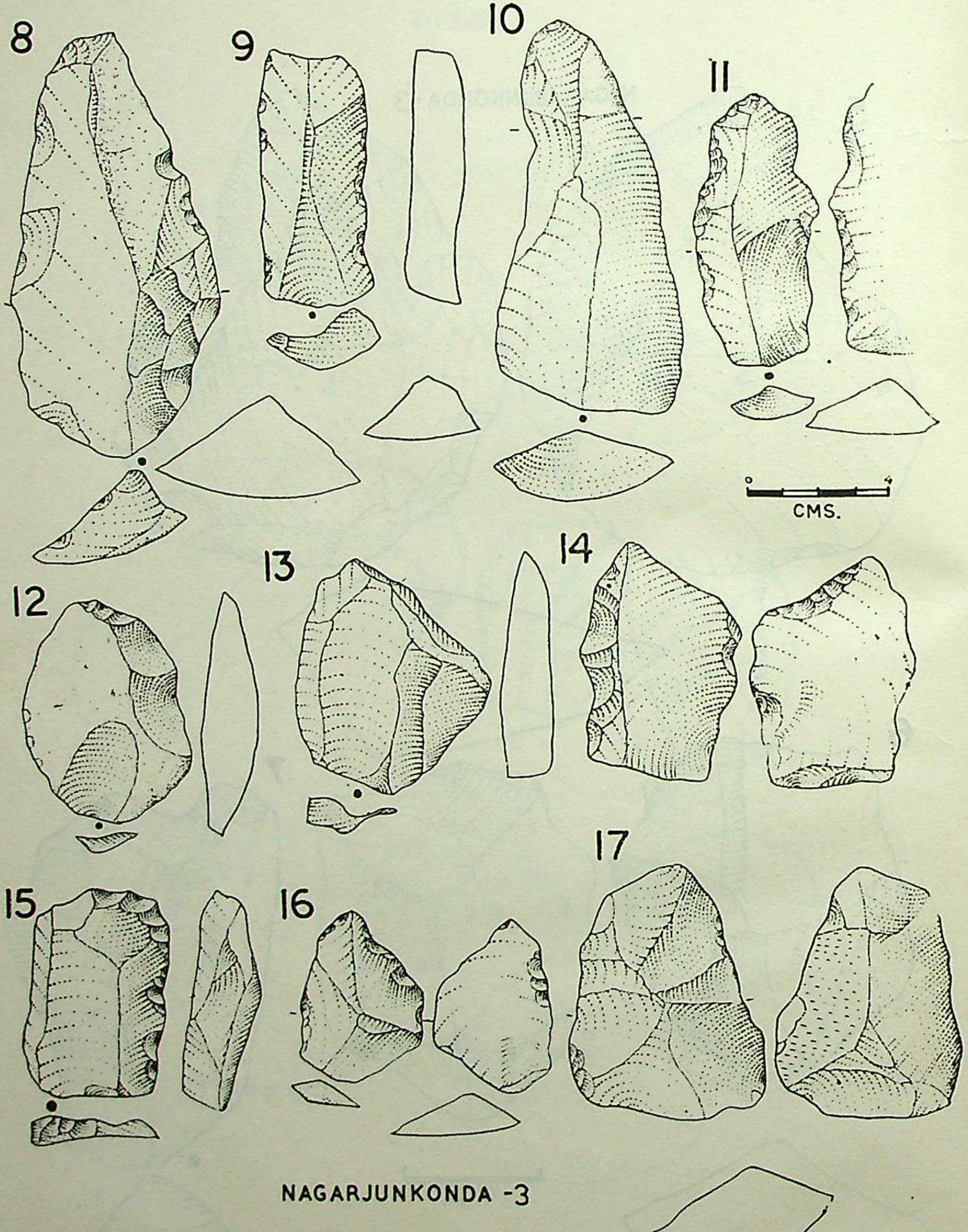
5. Prepared core; 6. Levallois core; 7. Side-Scraper on Flake type V.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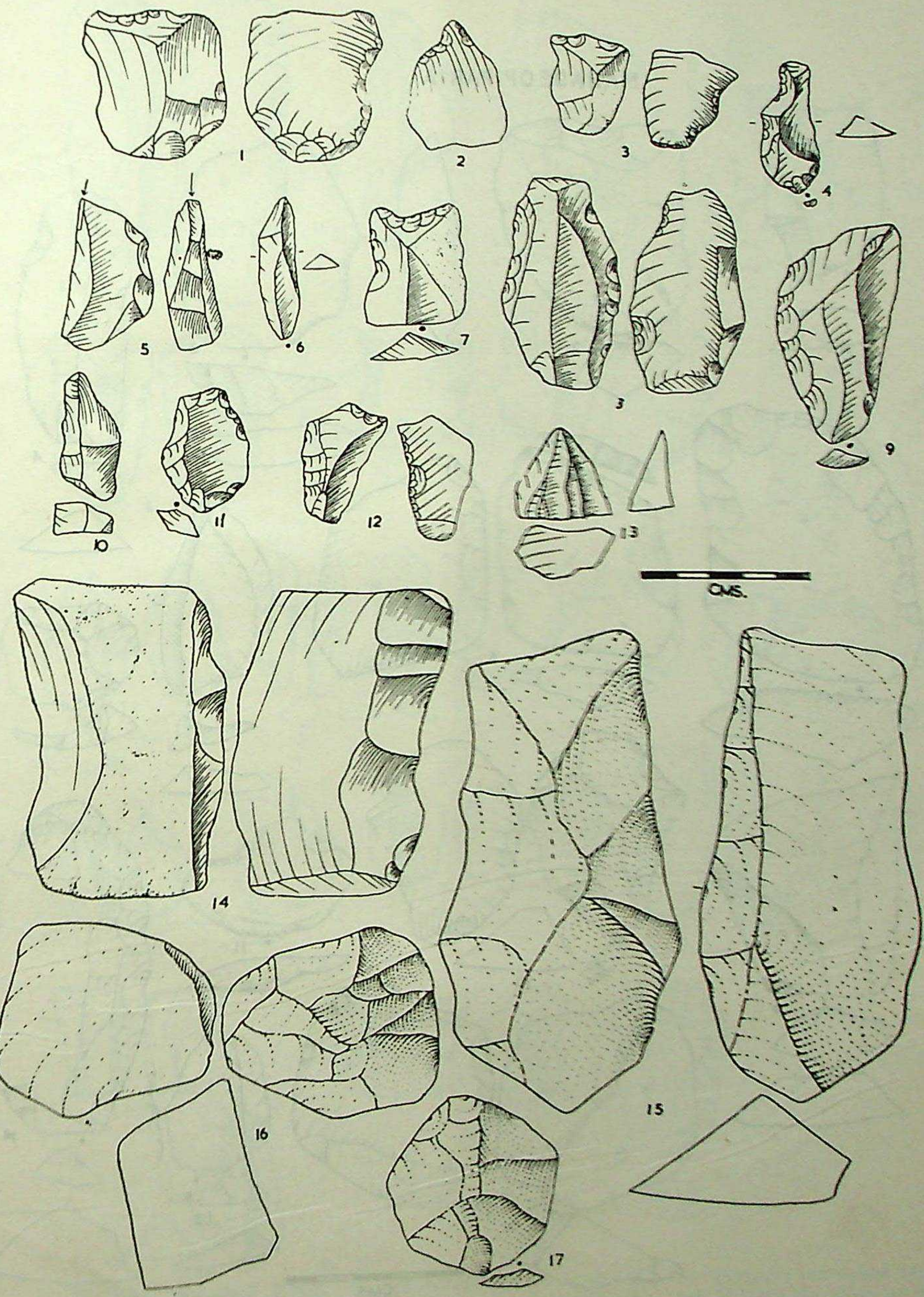
NAGARJUNKONDA -3

8. Side-scraper on flake type V; 9. Partially retouched blade; 10. Partially retouched flake type VIII; 11. Primary blade with marginal retouching; 12. Side-scraper on flake type II; 13. Flake type VIII: 14. Angle scraper on flake type VIII; 15. Side-scraper on flake type IX; 16. Point on Levallois flake; 17. Levallois core.

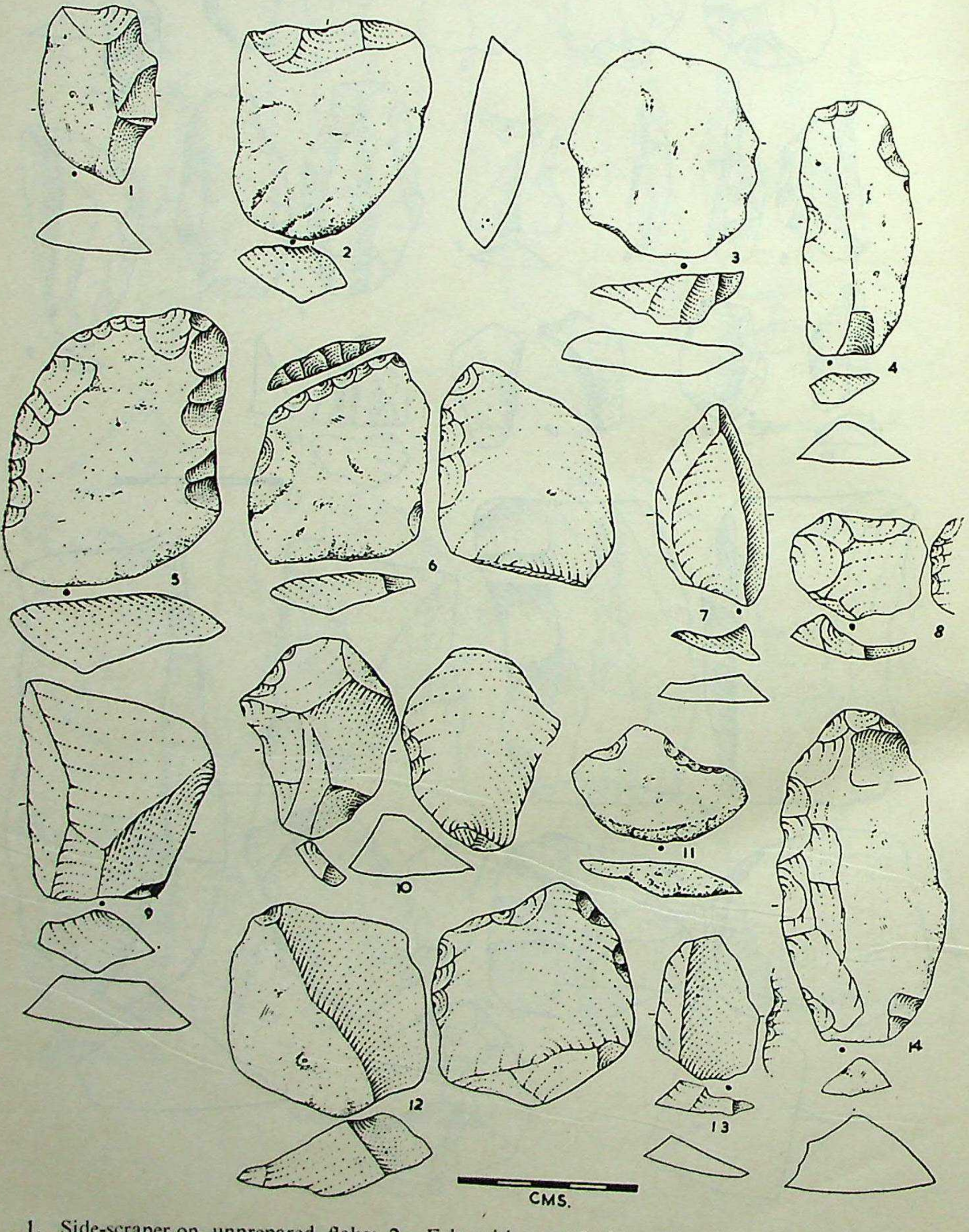
Pl.-XLI

NEVASA



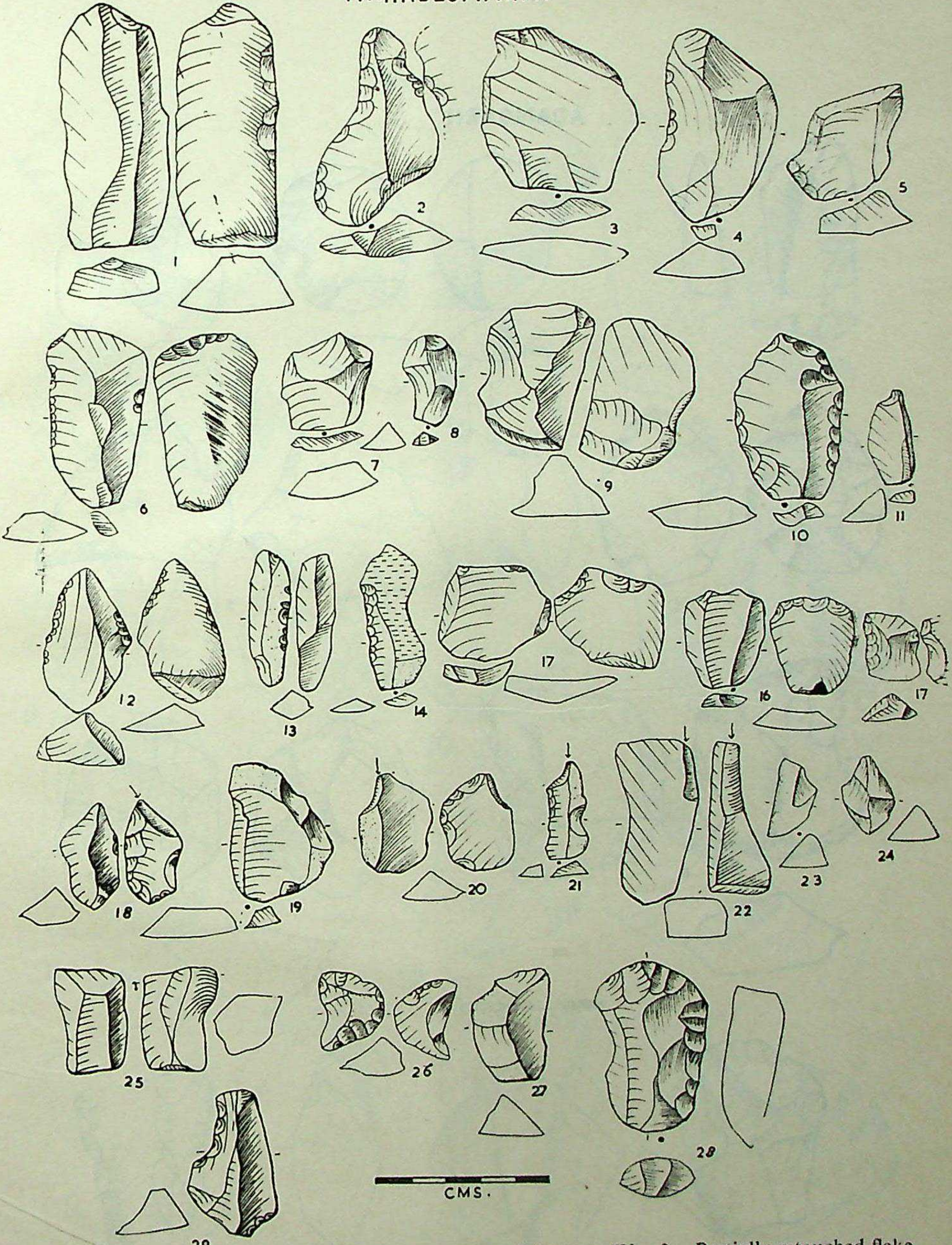
1. Angle-scraper on Levallois flake; 2. Borer on split pebble; 3. Partially retouched flake-type VI; 4. Partially retouched primary blade; 5. Burin on split pebble; 6. Blade; 7. Wide-scraper on flake type V; 8 & 9. Side scraper on flake type VIII; 10. Diverse; 11. Side-scraper on flake type VIII; 12. Double-side-scraper on flake type VIII; 13. Blade core; 14. Side-scraper on flake type V; 15. Cleaver on Levallois flake; 16. Prepared core; 17. Levallois flake.

MAHADEOPIPARIA



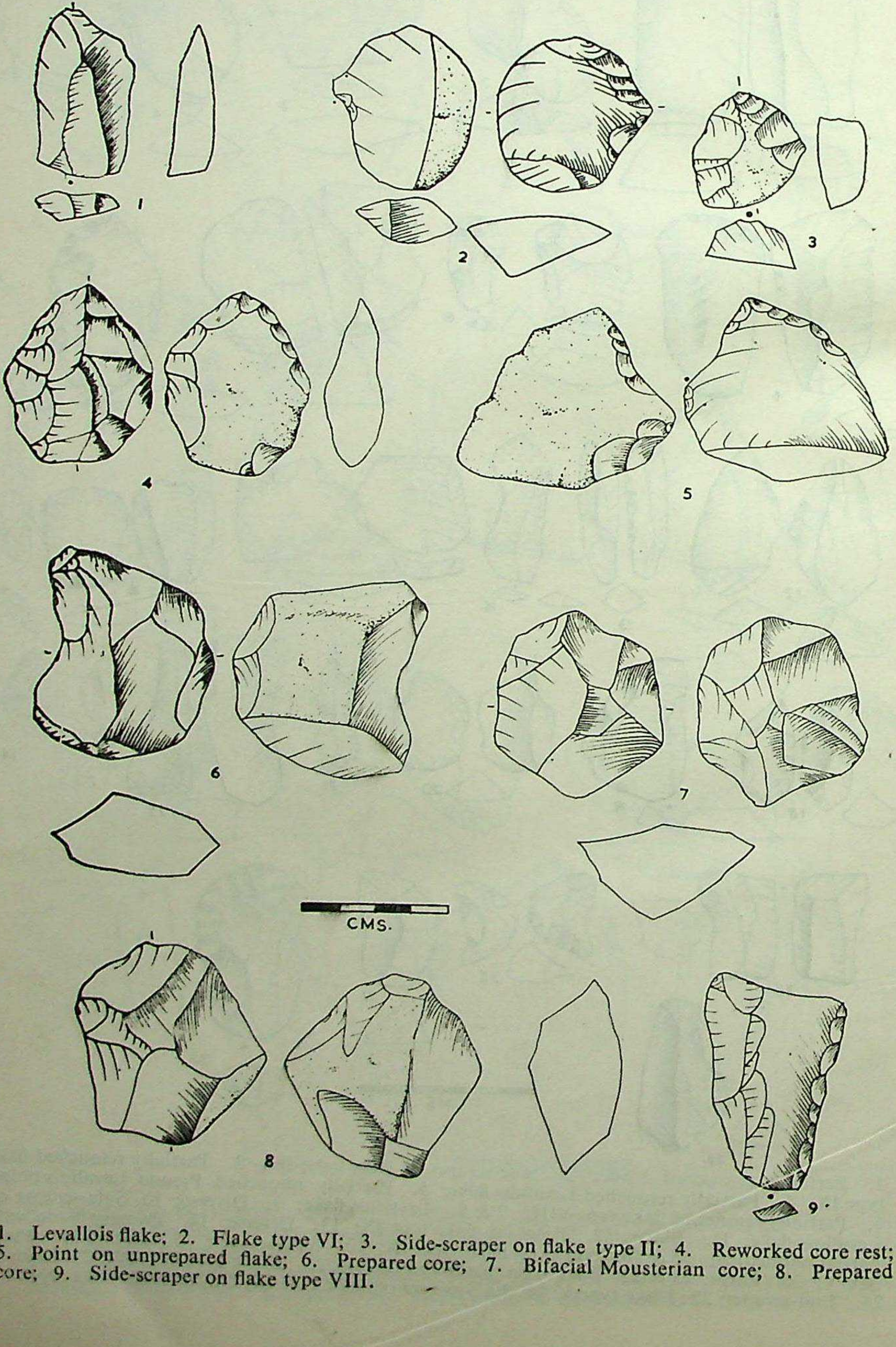
1. Side-scraper on unprepared flake; 2. Fake with retouched top; 3. Flake type II; 4. Blade
5. Double-side-scraper on flake type II; 6. Wide-scraper on flake type III; 7. Levallois point;
8. Side-scraper on flake-tppe IX; 9. Levallois flake; 10. Partially retouched Levallois flake;
11. Partially retouched unprepared flake; 12. Partially retouched flake type VI; 13. Partially
retouched Levallois point (broken); 14. Side-scraper on unprepared flake.

MAHADEOPIPARIA



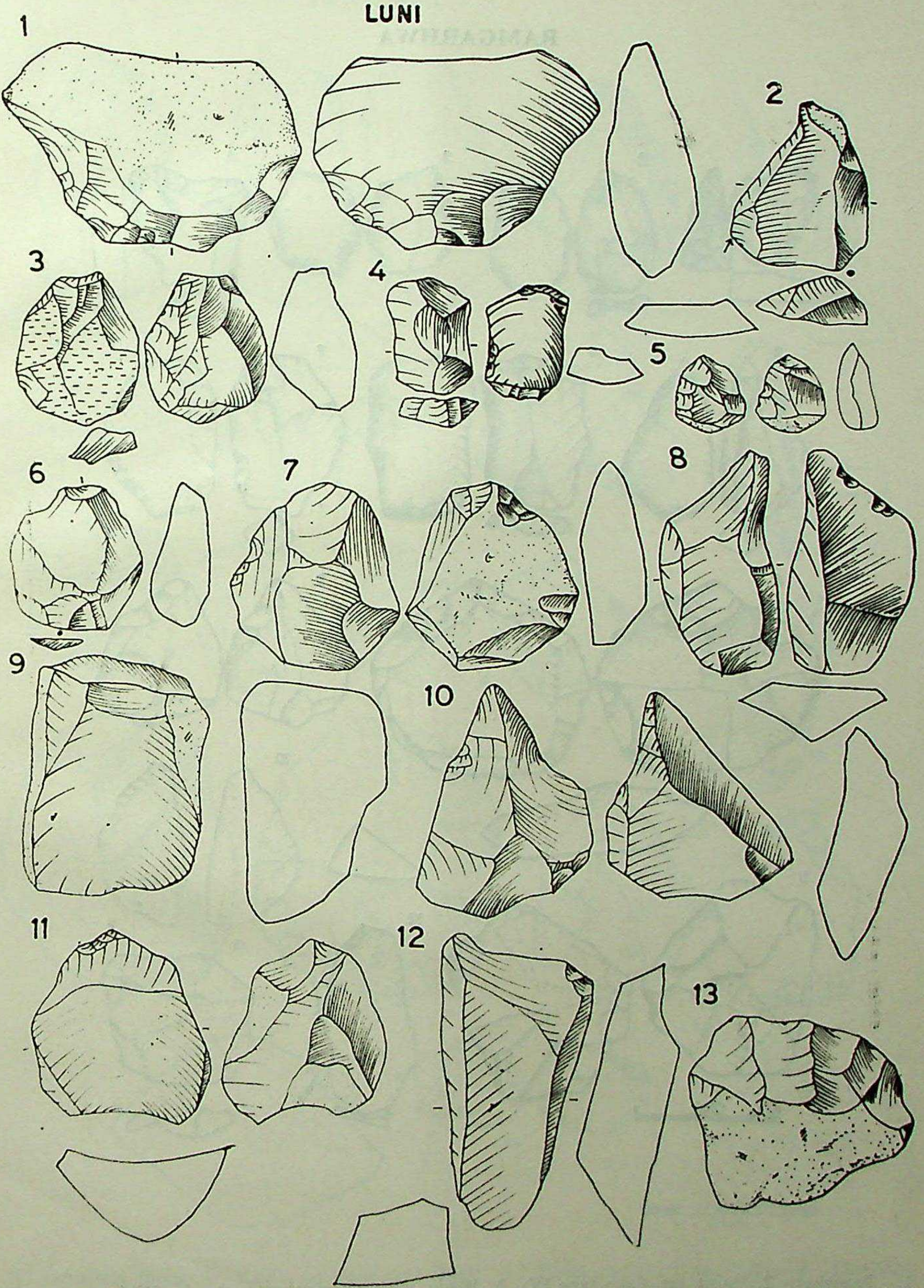
1. Partially retouched blade; 2. Side-scraper on flake type; IX; 3. Partially retouched flake type IX: 4. Partially retouched Levallois flake; 5. Partially retouched Pseudo Levallois point; 6. Partially retouched flake type VIII; 7 & 8. Levallois flake: 9. Diverse; 10. Side-scraper on Levallois flake; 11. Blade; 12. Point on flake type IX; 13. Diverse; 14. Primary blade with partial retouching; 15 & 16. Scraper on flake type IX; 17. Side-scraper; 18. Burin; 19. Flake type V; 20. Burin; 21 & 22. Burins on blade and nodule; 23. Flake-type IV; 24 & 25. Diverse; 26. End-scraper; 27. Flake type V; 28. End-scraper on flake type IX; 29. Notched flake type V.

ADAMGARH



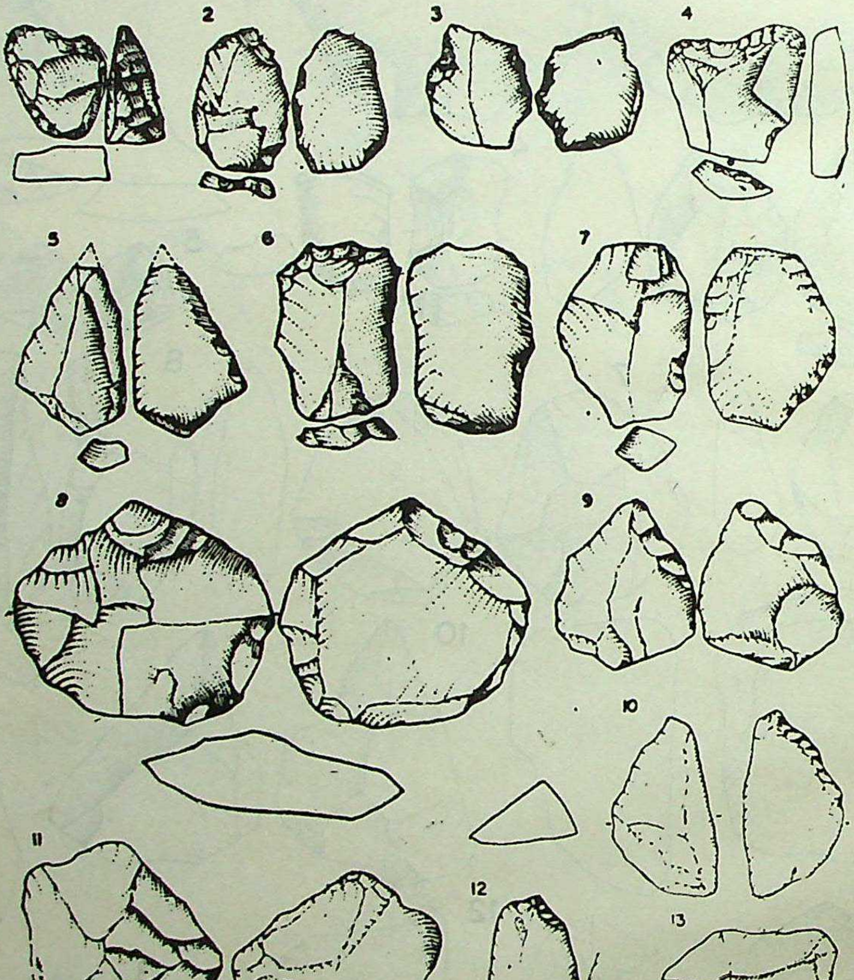
1. Levallois flake; 2. Flake type VI; 3. Side-scraper on flake type II; 4. Reworked core rest; 5. Point on unprepared flake; 6. Prepared core; 7. Bifacial Mousterian core; 8. Prepared core; 9. Side-scraper on flake type VIII.

Pl.-XLV



1. Unprepared flake with retouched base; 2. Pseudo Levallois point; 3. Diverse; 4. Partially retouched Levallois flake; 5. Scraper on nodule; 6. Levallois flake; 7. Levallois core: 8. Diverse; 9. Prepared cores; 10 & 11. Prepared cores; 12. Diverse; 13. Scraper on nodule.

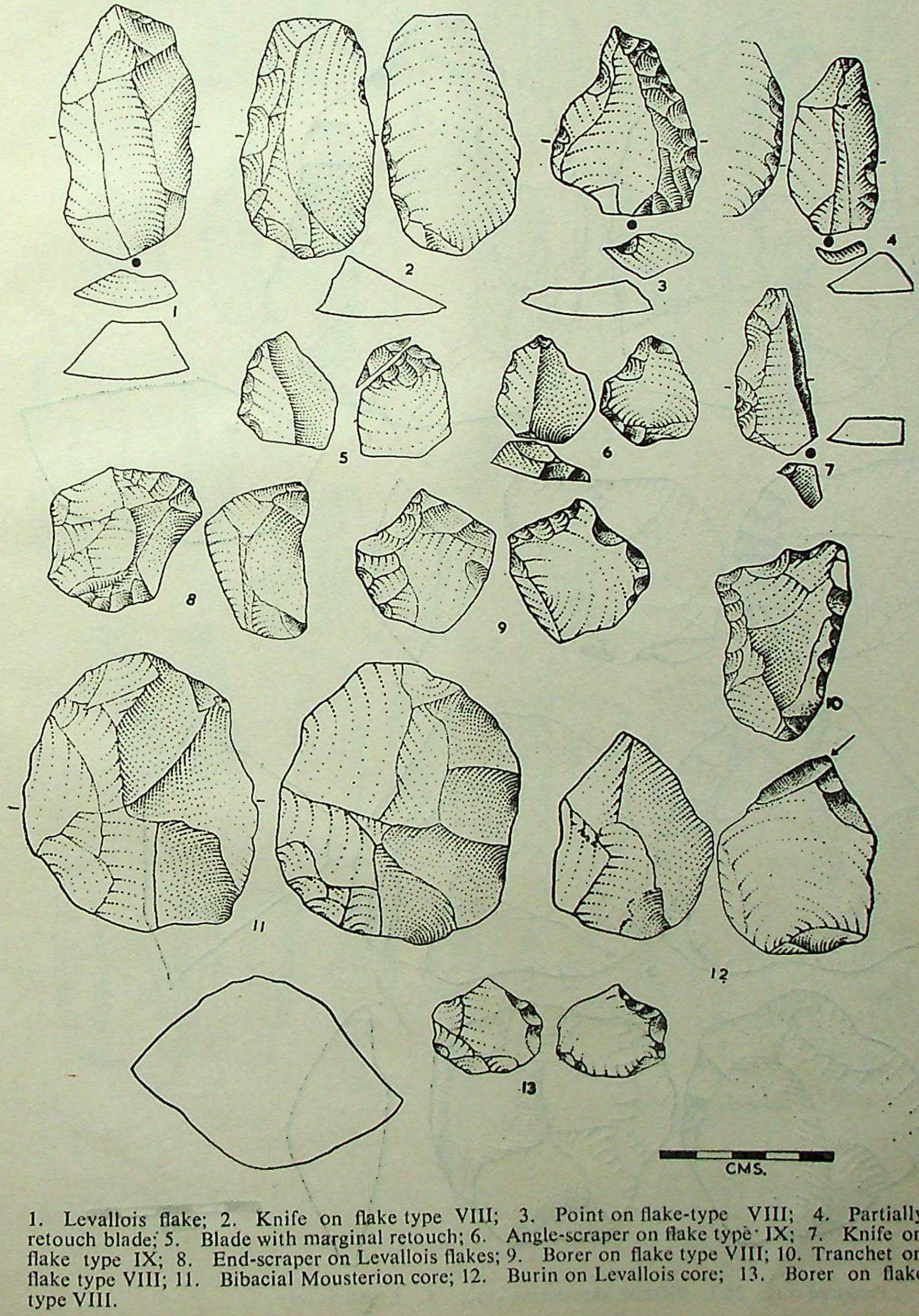
RAMGARHWA



1. Tranchet; 2. Point on flake type IX; 3. Blade with marginal retouch; 4. Wide-scraper on Levallois flake; 5. Side-scraper on Levallois point; 6 & 7. Scraper on Levallois flakes; 8. Levallois core; 9. Point on flake-type VI; 10. Side-scraper on flake type VIII; II-Bifacial Mousterian core; 12. Borer on blade; 13. Levallois flake.

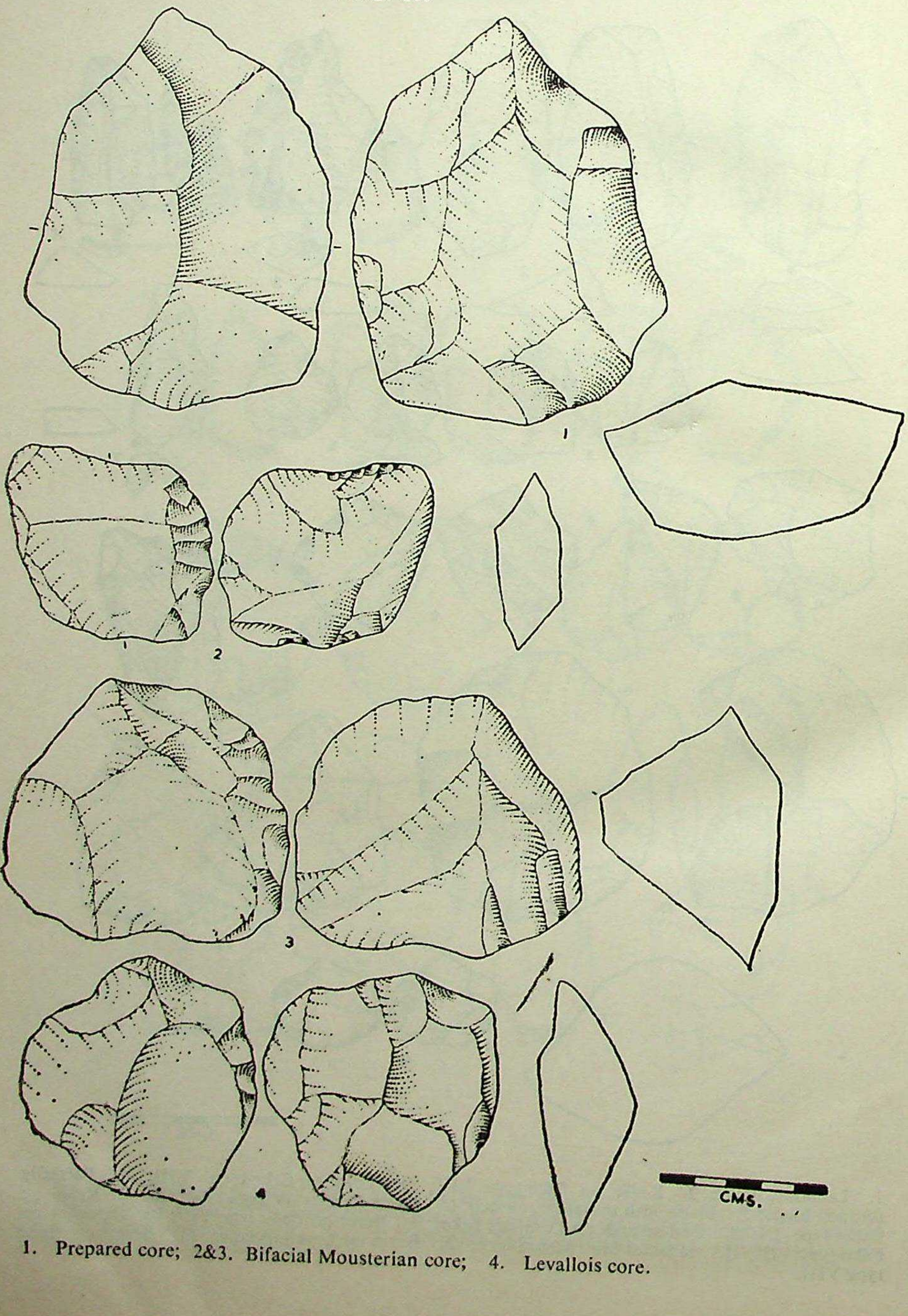
Pl.-XLVII

JAMALPUR



1. Levallois flake; 2. Knife on flake type VIII; 3. Point on flake-type VIII; 4. Partially retouch blade; 5. Blade with marginal retouch; 6. Angle-scraper on flake type IX; 7. Knife on flake type IX; 8. End-scraper on Levallois flakes; 9. Borer on flake type VIII; 10. Tranchet on flake type VIII; 11. Bibacial Mousterion core; 12. Burin on Levallois core; 13. Borer on flake type VIII.

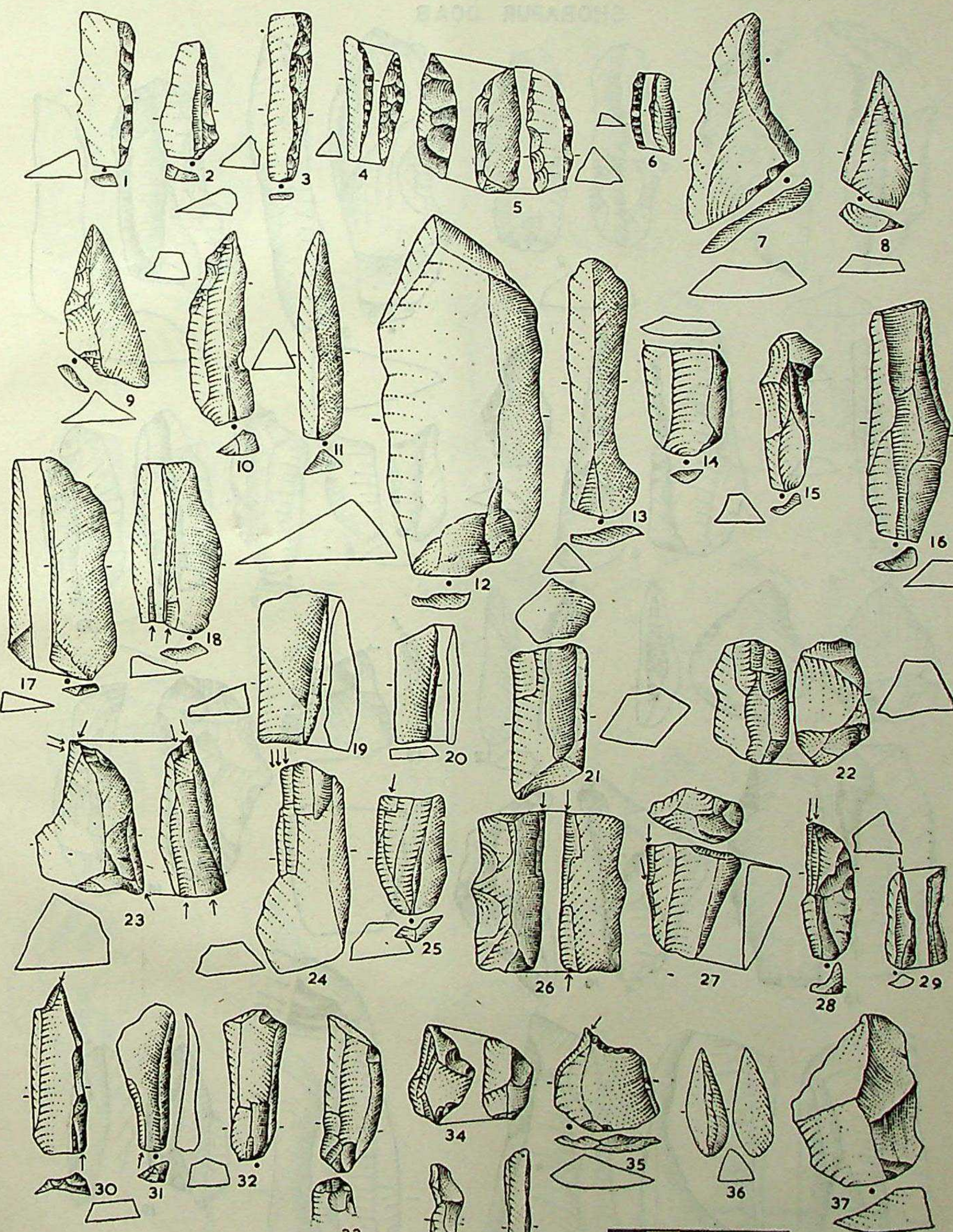
JAMALPUR



1. Prepared core; 2&3. Bifacial Mousterian core; 4. Levallois core.

Pl.-XLIX

VEDULLACHERVU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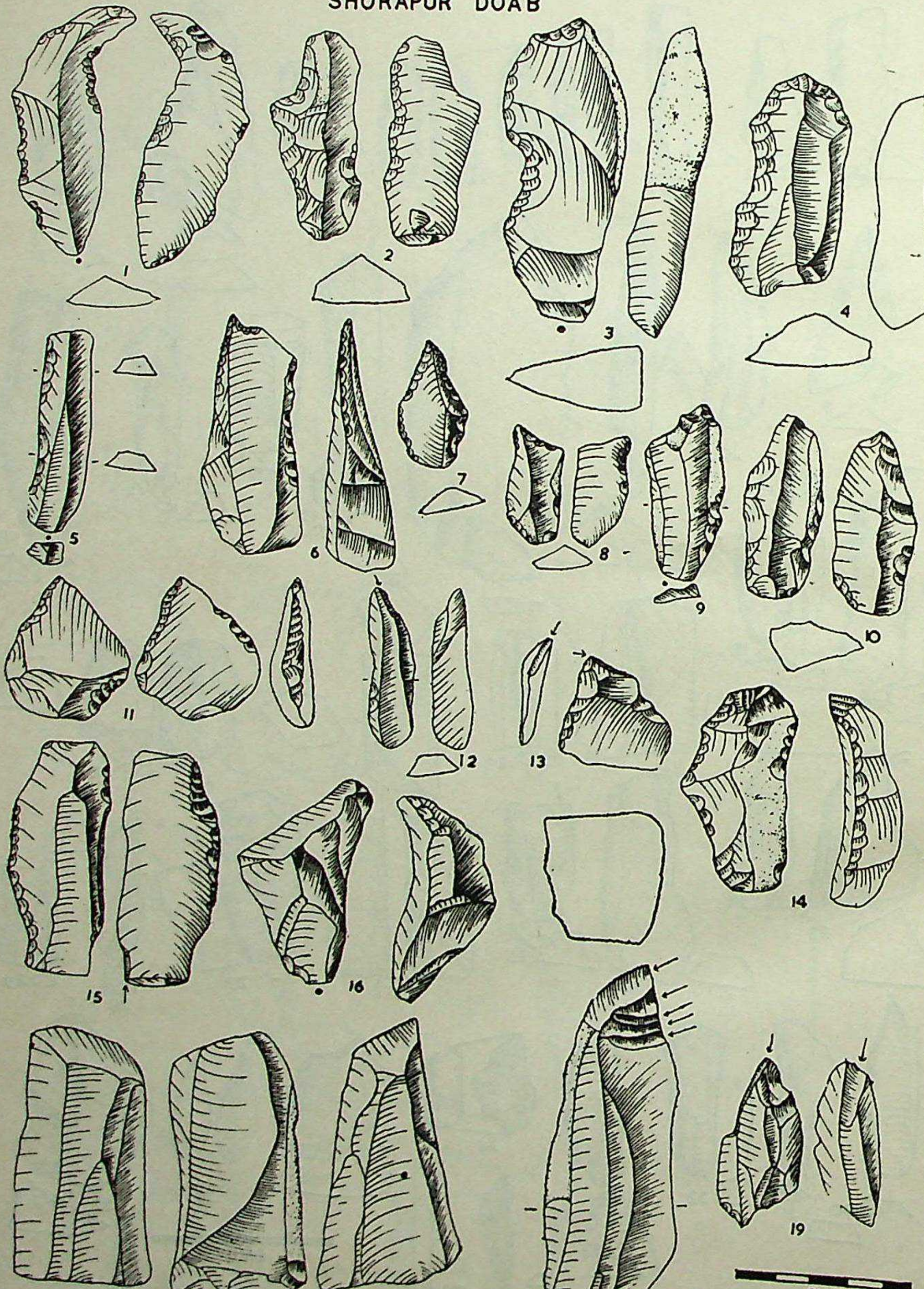
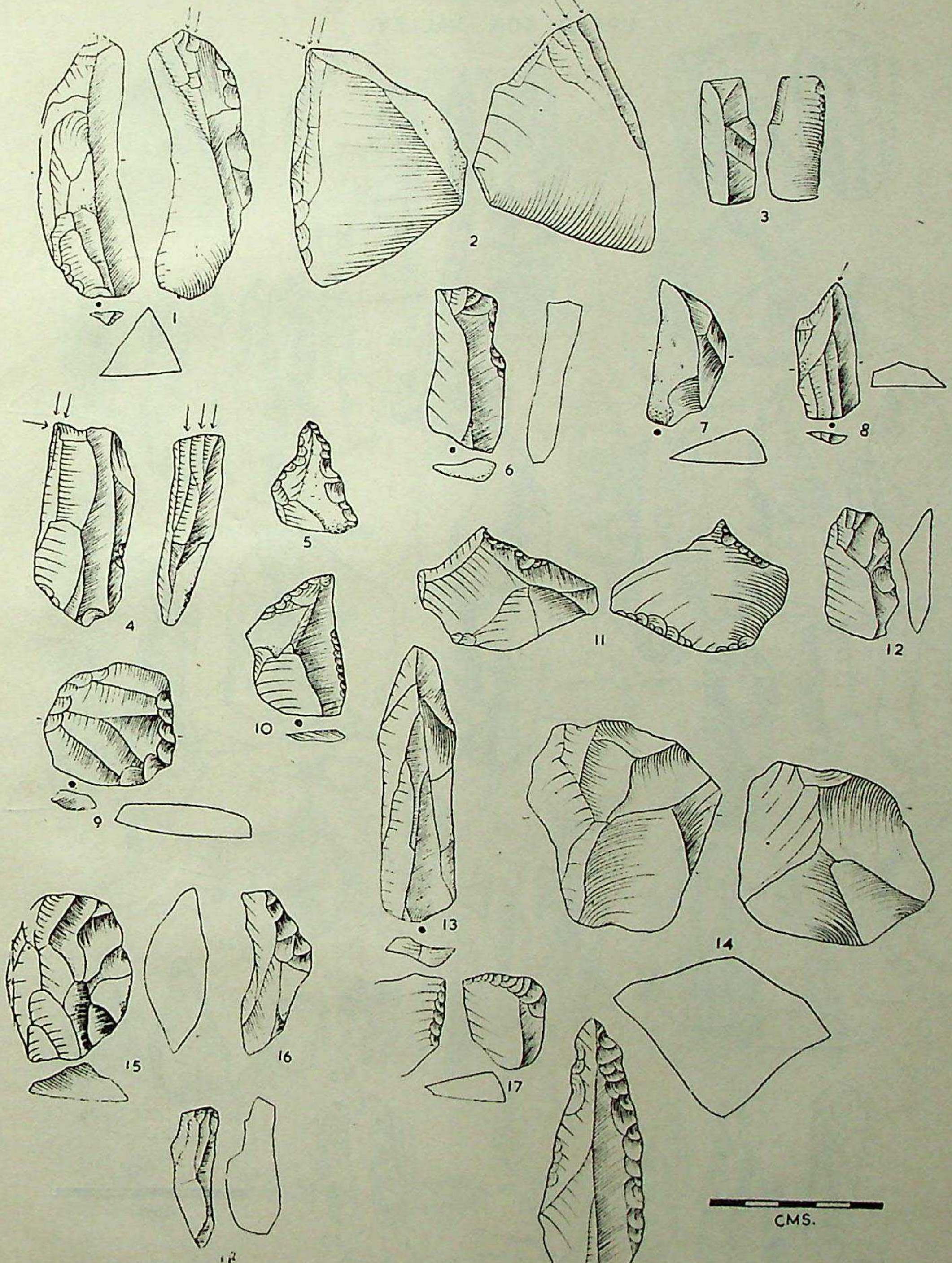
1 to 6. Backed blades 7 & 8. Levallois points; 9. Partially retouched flake type VIII; 10. Partially retouched blade; 11 to 15. Blades with unfaceted striking platforms; 16. Levallois blade; 17. Blade with faceted striking platform; 18, 28 to 31. Burin on blades; 19 & 20. Blades; 21 & 22. Blade cores: 23 & 24. Burin on cores; 25. Burin on flake type IX; 26 & 27. Burins on split cores; 32, 33 & 38. Blades; 34. Prepared core; 35. Burin on flake type IX; 36 & 39. Diverse 37. Levallois flake.

SHORAPUR DOAB



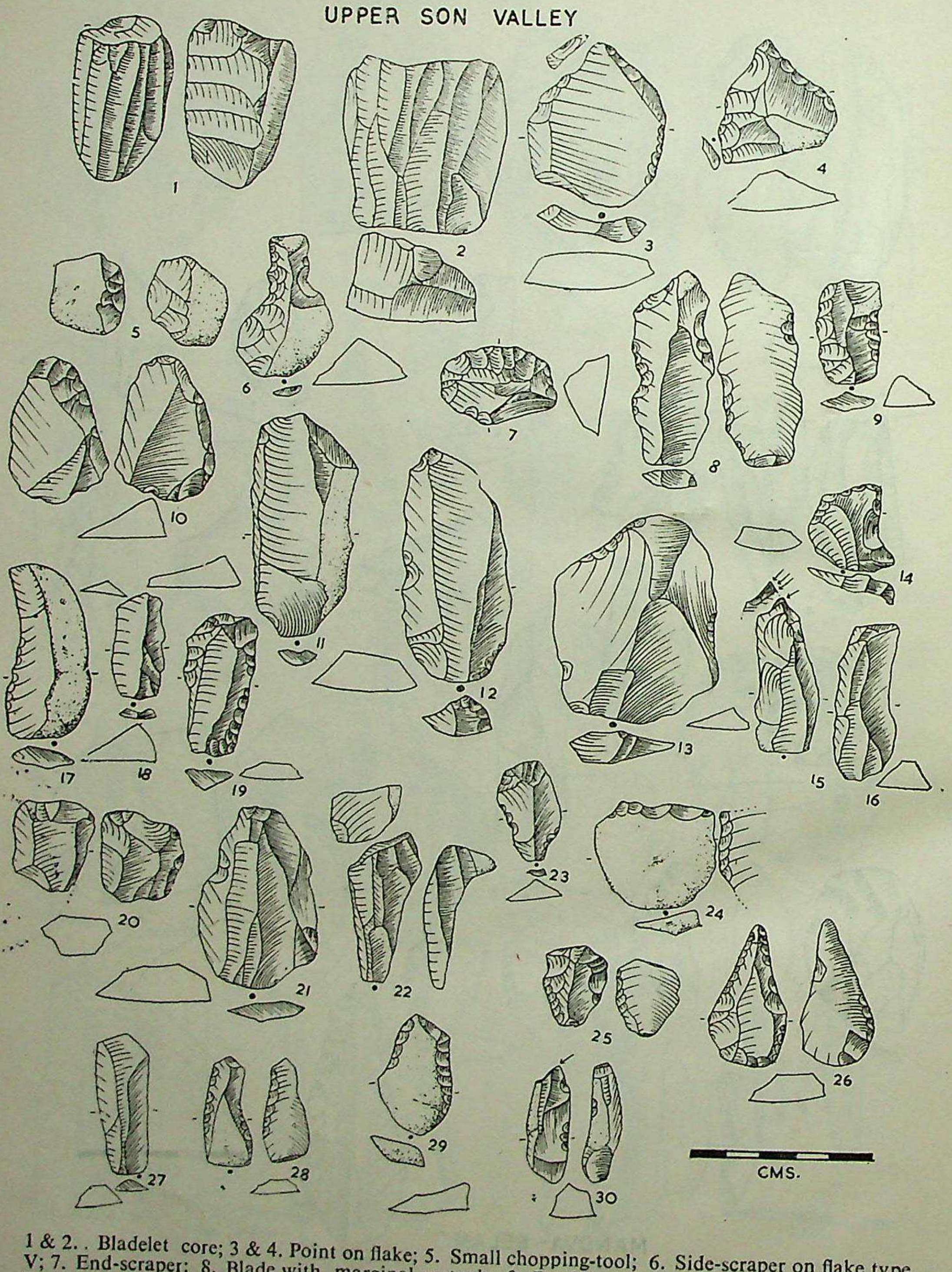
1&2. Primary blades with marginal retouch; 3. Core rejunvinating blade with retouched margin; 4 & 5. End-scraper on prepared flake: 6. Tranchet ; 7. Point on prepared flake; 8. Truncated blade; 9. Point on blade; 10. Side-scraper on blade core; 11. Point on flake type VIII; 12. Burin on blade 13. Burin on prepared flake; 14. End-scraper on primary blade; 15. Blade with marginal retouch; 16. Core rejuvinating blade; 17. Blade core; 18 & 19 Burin on core.

Pl.-LI



MANDVA-BELAN

1 to 4. Burins; 5. Point on partially prepared flake: 6. End-scraper on blade; 7. Side-scraper on flake type I; 8. Burin on flake type IX; 9. Double-side-scraper on flake type VIII; 10. Partially retouched flake type V; 11. Borer on Levallois flake; 12. End-scraper on split nodule; 13. Core rejuvinating blade; 14. Bifacial Moustrian core; 15. End-scraper on split core; 16, Pebble scraper; 17. Angle-scraper on prepared flake; 18. Burin on core; 19. Backed blade.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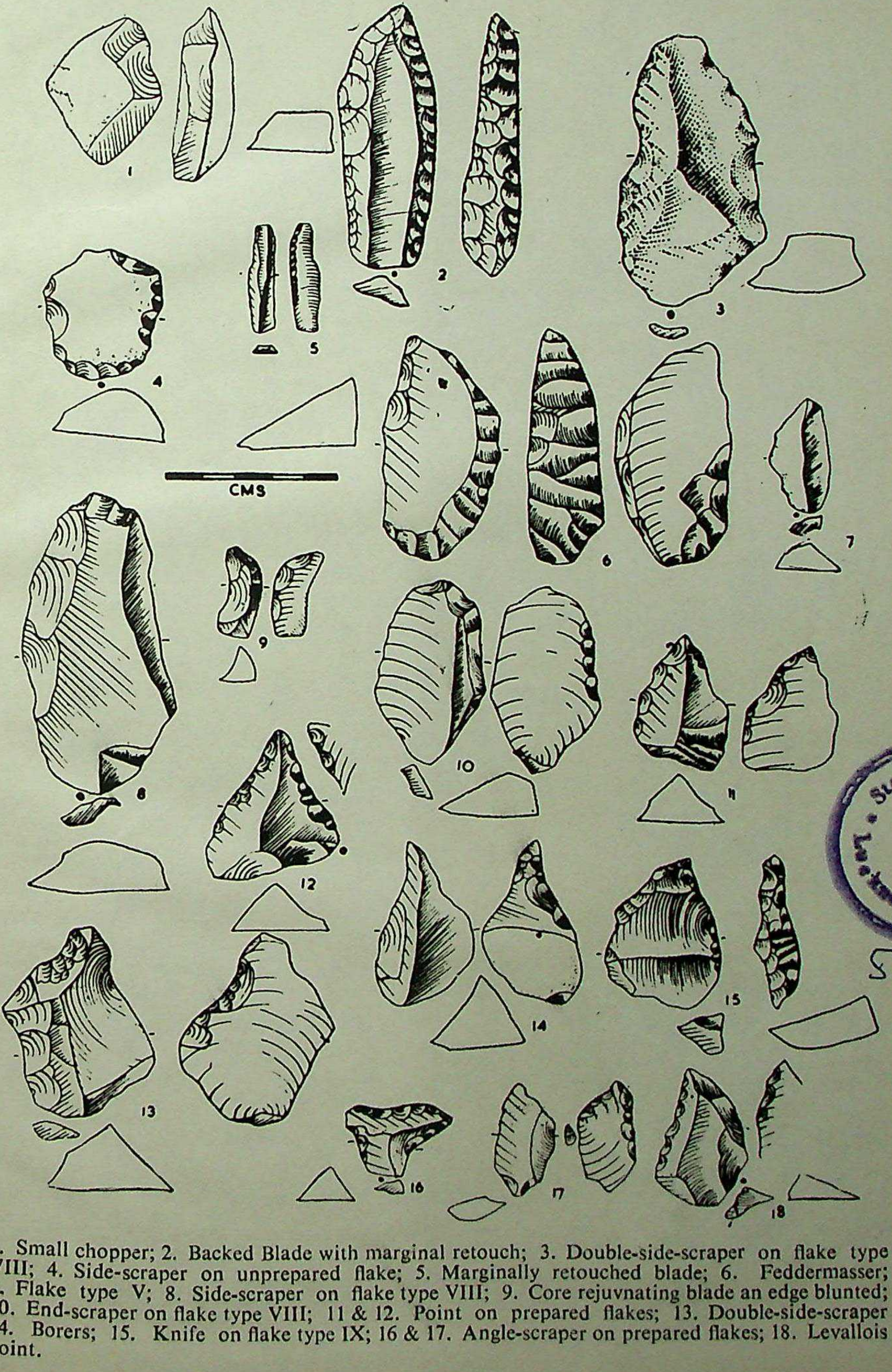
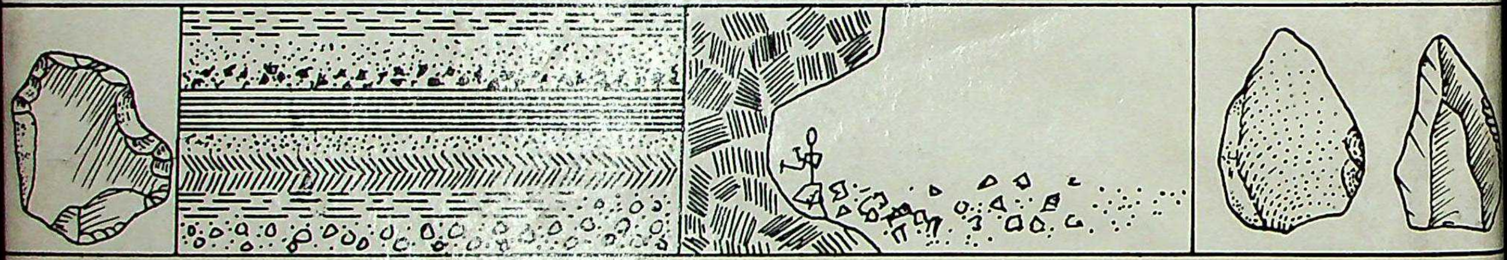
1 & 2. . Bladelet core; 3 & 4. Point on flake; 5. Small chopping-tool; 6. Side-scraper on flake type V; 7. End-scraper: 8. Blade with marginal reotuch; 9. Double-side-scraper on flake type V; 10. End-scraper on core; 11 & 12. Blades; 13. Partially retouched Levallois flake; 14. Point on flake type IX; 15. Burin on core rejuvinating blade; 16 to 19. Blades; 20. Prepared core; 21. Partially retouched flake type VIII; 22. Core rejuvinating blade; 23 & 25. and scraper on prepared flake: 24. Angle-scraper on prepared flake; 26. Retouched Levallois point; 27 & 28. Blade; 29. Point on unprepared flake; 30. Burin on core rejuvinating blade.

BORI-BETI



State Museum Library, Lucknow
5334

1. Small chopper; 2. Backed Blade with marginal retouch; 3. Double-side-scraper on flake type VIII; 4. Side-scraper on unprepared flake; 5. Marginally retouched blade; 6. Feddermasser; 7. Flake type V; 8. Side-scraper on flake type VIII; 9. Core rejuvnating blade an edge blunted; 10. End-scraper on flake type VIII; 11 & 12. Point on prepared flakes; 13. Double-side-scraper 14. Borers; 15. Knife on flake type IX; 16 & 17. Angle-scraper on prepared flakes; 18. Levallois point.



AGAM KALA PRAKASHAN DELHI